APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS

OTTAWA, December 1, 1904.

SIR,—I beg to submit for your approval the eighteenth annual report of the work done, and in progress, at the several experimental farms.

In addition to my report, you will find appended reports from the following officers of the Central Experimental Farm : From the Agriculturist, Mr. J. H. Grisdale; from the Horticulturist, Mr. W. T. Macoun ; from the Chemist, Mr. Frank T. Shutt ; from the Entomologist and Botanist, Dr. James Fletcher; from the Experimentalist, Dr. C. E. Saunders, and from the Poultry Manager, Mr. A. G. Gilbert.

From the Branch Experimental Farms there are reports from Mr. R. Robertson, Superintendent, and from Mr. W. S. Blair, Horticulturist of the Experimental Farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, Superintendent of the Experimental Farm for Manitoba, at Brandon; from Mr. Angus Mackay, Superintendent of the Experimental Farm for the North-west Territories, at Indian Head, and from Mr. Thomas A. Sharpe, Superintendent of the Experimental Farm for British Columbia, at Agassiz.

In these reports there will be found the results of many important and carefully conducted experiments in agriculture, horticulture and arboriculture, the outcome of practical and scientific work in the fields, barns, dairy and poultry buildings; the orchards and plantations at the several experimental farms; also of scientific research in connection with the breeding of cereals and in determining their relative value, also of research work in the chemical laboratories bearing on many branches of agricultural and horticultural employment and of information gained from the careful study of the life histories and habits of injurious insects and the methods by which noxious weeds are propagated and spread, together with the most practical and economical measures for their destruction. In the report of the Entomologist and Botanist will

also be found particulars of the experiments and observations which have been made during the past year in connection with the Apiary.

The large and constantly increasing demand by the farmers of the Dominion for the publications issued from the experimental farms, the rapidly extending correspondence and the readiness shown by farmers everywhere to co-operate with the work of the farms in the testing of new and promising varieties of cereals furnish gratifying evidence of the desire for information and improvement among this class of the community, also of the high esteem in which the work of the farms is held. It is hoped that the facts brought together in the present issue will be found of much practical value to the Canadian farmer and fruit-grower, and that they may assist in advancing agriculture and horticulture in this country.

I have the honour to be, sir,
Your obedient servant,

WM. SAUNDERS,
Director of Experimental Farms.

To the Honourable
The Minister of Agriculture,
Ottawa.

ANNUAL REPORT

OF THE

EXPERIMENTAL FARMS

REPORT OF THE DIRECTOR, WM. SAUNDERS, LL.D., F.R.S.C., F.L.S.

The general results of farm work throughout the Dominion, although not so uniformly favourable as in some other years, have on the whole been fairly satisfactory. The lengthened drought which prevailed in the Maritime Provinces during June and the greater part of July, reduced the hay crop considerably, leaving it from 20 to 30 per cent below the average. The grain, also, in most districts for the same reason gave lighter crops than usual, while pastures were seriously injured. In Quebec and Ontario the general conditions have been more favourable. The season, however, was cooler than usual, and although the rainfall in most places was sufficient, the crops did not make rapid growth. Owing to the severe winter, the fall wheat in Western Ontario was much injured, and nearly one-fourth of the crop was ploughed up. The average yield of that harvested was considerably below the average of past years. Spring wheat gave a yield about equal to the average, while barley and oats gave excellent crops, considerably above the average returns. In hay, also, the crop was well above the average.

In Manitoba the spring opened late; otherwise the season was favourable. Farmers have, however, suffered from an unusual invasion of rust, which reduced the crops of wheat and oats in some districts, but this was not sufficiently general to materially affect the total crop, and the high price paid for wheat this year, together with the increased area under crop will probably more than make up for any loss from rust. In the Territories seeding was also late, with favourable weather until the middle of June, when a period of drought set in which continued until the middle of July. Then timely rains saved the grain from injury, but the straw was considerably shorter than usual. The wheat crop in the Territories will probably average higher than in Manitoba, and the largely increased area there, together with the high prices realized, should materially assist in placing Territorial farmers in a very prosperous condition. The acreage now prepared for grain next season is much larger than in 1903, both in Manitoba and the Territories, and the prospects for the future are bright.

In the coast climate of British Columbia the rainfall in May, June and part of July was less than usual, but crops did not materially suffer. In the interior districts, where the rainfall is always light, the shortage this season reduced the grain yield in many localities below the average of past years.

In carrying on the work of the Experimental Farms from year to year, persistent efforts are made to assist farmers with information in regard to the maintenance of the fertility of their land, its proper treatment, and in the selection of highly productive seed of best quality; also to aid them generally in their endeavours to overcome difficulties which present themselves from time to time in the carrying on of

farm work. These efforts have been much appreciated. The mass of new facts bearing on agriculture contained in this eighteenth annual report gives evidence of the skill and assiduity of the officers composing the staff of the Experimental Farms, and of their untiring efforts to benefit the cause of agriculture. At all these institutions visiting farmers are always welcome, and those who have an opportunity of personally inspecting the work in progress, after seeing its extent and its practical character, usually leave with a higher regard for the farms than they had before. Those who are unable to visit any of the farms can obtain, for the asking, the annual reports, in which the experiences gained at all the Experimental Farms are given, the perusal of which will give the reader, wherever he may be located, much information of practical value. Bulletins also are issued from time to time on special subjects, and are supplied free in the same manner as the reports.

THE BREEDING OF CROSS-BRED APPLES FOR THE CANADIAN NORTH-WEST.

As soon as the branch experimental farms were established in the Canadian North-west experiments were begun on a rather extensive scale with both large and small fruits, with the object of finding out what sorts could be successfully grown there. Hardy varieties of the apple received special attention on account of the general usefulness of this fruit, and of its importance as a healthful article of diet. During the first eight or ten years more than two hundred of the hardiest sorts of cultivated apples obtainable in northern Europe and other northern countries were thoroughly tested, both at Brandon and Indian Head. These were planted in considerable numbers, often from twenty to fifty trees of a kind, in shelter of different degrees and without shelter, but none of these have yet produced a single apple. Experiments are still being continued with such new varieties as are announced from time to time as specially hardy, and thus far with similar negative results.

In 1887, the year during which work on the Experimental Farms was begun, seed was obtained from the Imperial Botanic Gardens at St. Petersburg, Russia, of a small wild Siberian crab-apple known as the 'Berried Crab,' *Pyrus baccata*. This wild crab is said to grow in great abundance near the shores of the Baikal Sea, and in other parts of Northern Siberia. Young trees were raised from this seed, and some of them were sent to Brandon, Man., and some to Indian Head, N.W.T., and at both places they were found to be entirely hardy. During a trial of fourteen or fifteen years the 'Berried Crab,' has never been injured by winter, and the trees have started from the terminal buds on the branches every season. These trees have fruited abundantly for many years, but the fruit is small—not much larger than a cherry—astringent and acid, and sometimes bitter. It does, however, make excellent jelly, hence this fruit in its unimproved form is found useful. It is also highly ornamental when covered with blossom in the spring, or with its fruit in the autumn. The trees are rather dwarf in habit, low branched and strongly built, with the fruit very firmly attached to the tree. From their build and general character they are well adapted to resist the winds to which trees are exposed on the North-west plains.

BEGINNING OF THE WORK OF CROSS-BREEDING.

After four or five years' experience had thoroughly established the character of this tree for extreme hardiness, efforts were made to improve the size and quality of the fruit by cross-fertilizing the flowers of *Pyrus baccata* with pollen from many of the hardiest and best sorts of apples grown in Ontario. This work was begun in 1894, and has since been continued along several different lines. The seeds obtained from the first crosses were sown in the autumn of that year and germinated the following spring producing in all about 160 thrifty young trees. These were planted in the spring of 1896. Many of them grew very rapidly, and soon made shapely specimens. The

young trees resulting from subsequent experiments have been planted from year to year in orchards at Ottawa, Brandon and Indian Head. In 1899 thirty-six of the cross-bred apples first produced and grown at Ottawa fruited, and five of them were of such size and quality as to justify their being propagated for more general test. The fact that so many of these fruited on the fourth year from the sowing of the seed indicates a very early bearing habit. Since then about two hundred more of these cross-bred apples have borne fruit, and the number of varieties worthy of extended cultivation has been considerably increased. Root grafts of some of the more promising sorts were early made, and these have been tested some three or four years at each of the North-western Experimental Farms, and have shown no indications of tenderness, even when planted in exposed situations. The cross-bred sorts grafted on the roots of *Pyrus baccata* have produced trees which so far as they have been tried seem to be quite as hardy as the wild form of *baccata*, and there is every reason to expect that they will prove generally hardy throughout the North-west country.

EXPERIMENTS WITH 'PYRUS PRUNIFOLIA.'

In 1896 a series of crosses was begun on another sort of wild crab known as *Pyrus prunifolia.* This is regarded by some authorities as a distinct species; by others it is believed to be a hybrid between *P. malus*, the wild crab of Europe, and *P. baccata.* Seeds of this form were also obtained from the Royal Botanic Gardens of St. Petersburgh, Russia. The fruit of *P. prunifolia* is usually larger than that of *baccata*, and will average nearly double the size. Its hardiness in the North-west has also been established by a test covering a number of years on both of the Experimental Farms, at Brandon and Indian Head. The first crosses with this species were made in 1896, and since then many new sorts have been originated.

APPLES FROM WHICH POLLEN WAS USED.

In the first crosses made on *Pyrus baccata* in 1894, pollen was used from the Tetofsky, Duchess and Wealthy apples, but since then pollen has been obtained from many other varieties of apples and used on *P. baccata, P. prunifolia*, or both, including Anis, Beautiful Arcade, Broad Green, Excelsior, Fameuse, Golden Russet, Haas, Herren, Krimskoe, McIntosh Red, McMahon White, Osimoe, Pewaukee, Red Astrachan, Ribston Pippin, Scott's Winter, Simbirsk No. 9, Swayzie Pomme Gris, Talman's Sweet, Winter St. Lawrence and Yellow Transparent. The number and variety of the crosses have thus been very much increased.

About 800 of these cross-bred varieties have been produced, and between 200 and 300 have fruited. While a large number have produced fruit of inferior quality, there have been obtained up to the present time 20 varieties in all, which from their superior size and quality may be regarded as useful for domestic purposes, and deserving of more extended trial.

VARIETIES PRODUCED.

On plate I there are shown figures of *Pyrus baccata* (No. 1), and eight of the new cross-bred sorts of natural size, all produced from this species. The relative increase in the size of the cross-bred sorts is manifest to the eye. On weighing good average samples we find that the larger of these cross-bred apples are from 12 to 14 times heavier than *P. baccata.*

2. Alberta. *Pyrus baccata* with Haas.—Tree a strong grower and an abundant bearer. Fruit size 1·6 inches across, 1·4 inches deep, round somewhat flattened and slightly ribbed. Calyx persistent. Stem about half an inch long. Colour greenish yellow with a bright red cheek. Flesh nearly white, juicy, slightly astringent (astrin-

gency scarcely perceptible when fruit is ripe). Quality fair to good. Season last week in September to middle of October.

3. Silvia. *P. baccata* with Yellow Transparent.— Tree a strong grower and fair bearer. Fruit, size 1·4 inches across, 1·5 inches deep, form somewhat pointed and ribbed. Calyx persistent. Stem ¼ to ½ inch long. Colour pale yellow. Flesh of pleasant flavour, subacid, no astringency. Quality good. Ripe August 9 or 10, the earliest to ripen of all the cross-bred apples yet fruited.

4. Tony. *P. baccata* with McMahon White. Tree a strong grower and a heavy bearer. Fruit, size 1·6 inches across and 1·4 inches deep. Form round, somewhat flattened. Calyx persistent. Stem about ·8 of an inch long. Colour greenish yellow, streaked and splashed with bright red, and with many yellowish dots. Flesh yellowish white, juicy, sprightly, subacid, slightly astringent, with a pleasant flavour. Quality good. Season late September and October. A group of specimens of this variety is shown on plate II.

5. Columbia. *P. baccata* with Broad Green.—Tree a very strong grower and a fair bearer. Fruit, size 1·8 inches across and 1·6 inches deep, somewhat conical, distinctly ribbed. Calyx protruding and persistent. Stem of medium length. Colour red with stripes and dots of a deeper shade. Flesh yellowish, lightly streaked with red, juicy, subacid with a pleasant flavour, slightly astringent. Season late September and October.

6. Elsa. *P. baccata* with Yellow Transparent.—Tree a strong grower and good bearer. Fruit, size 1·4 inches across and 1·3 inches deep; nearly round, slightly ribbed. Calyx persistent on a slightly raised eminence, ribbed. Stem about an inch long, slender, but strong. Colour bright yellow. Flesh fine grained, tender, juicy, rather acid, but of pleasant flavour. Quality good. Season latter part of August.

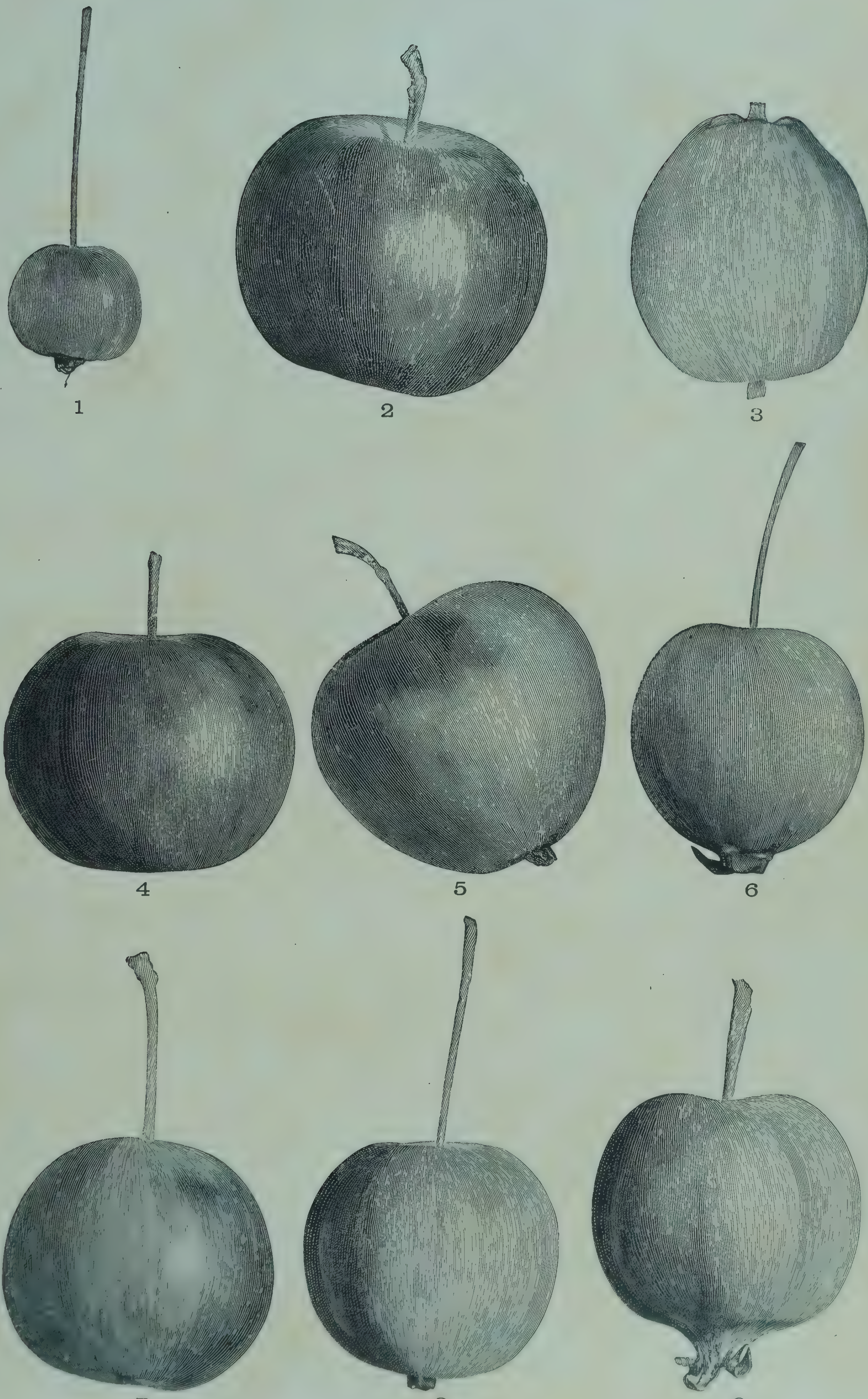
7. Prince. *P. baccata* with Tetofsky.—Tree a strong grower and very productive. Fruit, size 1·6 inches across and 1·3 inches deep, nearly round. Calyx drops in many of the specimens. Stem 1 to 1½ inches in length. Colour bright red (of a deeper shade on the side exposed to the sun), with a few paler dots and streaks. Flesh nearly white, juicy, subacid, somewhat astringent (astringency lessens as the fruit ripens). Of a pleasant flavour. Ripe early in Setpember.

8. Jewel. *P. baccata* with Yellow Transparent.—Tree a strong grower and a good bearer. Fruit, size, 1·4 inches across and 1·3 inches deep, nearly round, slightly elongated. Calyx persistent, stem about 1¼ inches long. Colour yellowish, with a pale red cheek. Flesh moderately firm, crisp, juicy, of good flavour, subacid with very little astringency. Quality good. Season, last week in August and early in September.

9. Robin. *P. baccata* with Simbirsk No. 9.—Tree a good grower and a medium bearer. Fruit, size, 1·5 inches across and 1·4 inches deep; nearly round, strongly ribbed. Calyx large, persistent and projecting. Stem about 1 inch long. Colour, yellow and red. Flesh very firm, juicy, subacid with a slight astringency and a pleasant flavour. Quality good, one of the best. Season, latter part of August and September.

10. Charles. *P. baccata* with Tetofsky.—Tree a very upright and strong grower, with large leathery leaves, and a medium bearer. Fruit, size, 1·6 inches across and 1·5 inches deep; nearly round, slightly ribbed. Calyx persistent. Stem rather long. Colour a uniform yellow. Flesh yellowish, solid, crisp, juicy, with a pleasant flavour, mildly acid and slightly astringent. Season, early in September.

11. Novelty. *P. baccata* with Wealthy.—Tree a vigorous grower with good foliage and fairly productive. Fruit, size, 1·6 inches across and 1·3 inches deep; nearly round, somewhat flattened at each end. Calyx persistent. Stem long and slender. Colour



1.—PYRUS BACCATA.
2.—ALBERTA.
3. SILVIA.
4. TONY.
5. COLUMBIA.
6.—ELSA.
7. PRINCE.
8.—JEWEL.
9. ROBIN.

deep red. Flesh a pale yellowish pink, firm, crisp, juicy, subacid and of fair quality. Season, middle to end of September.

12. Progress. *P. baccata* with Wealthy.—Tree a vigorous grower, fairly upright in habit and productive. Fruit, size, 1·4 inches across and 1·2 inches deep; nearly round, somewhat flattened at each end. Calyx persistent. Stem long and slender. Colour, red with some yellow and a dark red cheek. Flesh very firm, crisp, sub-acid, juicy, very slightly astringent and of fair flavour. Season, middle of September.

13. Aurora. *P. baccata* with Tetofsky.—Tree a fair grower and productive. Fruit, size, 1·5 inches across and 1·2 inches deep; nearly round, somewhat ribbed. Calyx persistent. Stem long. Colour, bright red almost all over. Very handsome. Flesh crisp, juicy, acid and of fair flavour. Astringency very slight. Ripe September 6 to 12.

14. Dawn. *P. prunifolia* with Simbirsk No. 9.—Tree a good grower and fairly productive. Fruit, size, 1·8 inches across and 1·6 inches deep. Calyx persistent. Stem about half an inch long. Colour, red, of a deeper shade on the sunny side. Flesh firm, white, juicy, distinctly sub-acid, with a pleasant flavour. Quality good. Ripe September 20 to 30.

15. Magnus. *P. prunifolia* with Simbirsk No. 9.—Tree a strong grower and a fair bearer. Fruit, size, 1·8 inches across and 1·7 inches deep; nearly round. Calyx persistent. Stem about half an inch long. Colour, orange and scarlet. Flesh firm, rather juicy but not crisp, subacid. Flavour aromatic, very slight astringent. Quality very good. One of the largest and best yet fruited of the cross-bred apples. Ripe September 20 to 30.

16. Manitou. *P. baccata* with McMahon White.—Tree a fair grower and productive. Fruit, size, 1·5 inches across and 1·2 inches deep; nearly round, distinctly ribbed. Calyx persistent, prominent, ribbed. Stem 1 to 1¼ inches long. Colour yellow, almost covered with bright red, becoming deep red where exposed to the sun. Flesh nearly white, juicy, sprightly, subacid, with a pleasant flavour. Quality fair. Ripe, end of September.

17. Pioneer. *P. baccata* with Tetofsky.—Tree a strong grower and a good bearer. Fruit, size, 1·5 inches across and 1·3 inches deep; nearly round, slightly ribbed. Calyx persistent. Stem rather long. Colour, yellow with a pink cheek. Flesh white, fine-grained, firm, crisp, subacid, slightly astringent, moderately juicy, with a pleasant flavour. Season latter part of September and October.

18. Golden. *P. prunifolia* with Golden Russet.—Tree a fair grower, and quite productive. Fruit, size 1·5 inches across, 1·2 inches deep, round, somewhat flattened at the ends. Calyx persistent, in a shallow basin. Stem ½ inch long, rather stout. Colour bright yellow. Flesh fairly juicy, rather sweet, very slightly astringent. Quality good. Season last week in August and September.

19. Bow. *P. baccata* with Pewaukee.—Tree a fairly strong grower and productive. Fruit, size 1·5 inches across and 1·2 inches deep. Calyx persistent. Stem rather long. Colour bright yellow, with a faint tinge of red. Flesh yellowish white, crisp, juicy, mildly subacid, not astringent, of good flavour. Season late in September.

20. Kent. *P. baccata* with McIntosh Red.—Tree a good grower and productive. Fruit 1·5 inches across and 1·3 inches deep, nearly round and ribbed about the calyx. Calyx persistent, and slightly projecting stem ¾ to 1 inch long. Colour deep red, with an orange shade deeper in tint on the sunny side. Flesh yellowish white, juicy, crisp, mildly subacid, slightly astringent and of fairly good flavour. Season end of September to December. A group of specimens of this variety is shown on plate II.

SUITABLE STOCKS FOR GRAFTING.

To ensure hardiness in a fruit tree not only must the part exposed to the air be capable of enduring the cold weather of winter, but the root on which the variety is grafted must be equally hardy, otherwise the tree will often perish at the root while the wood above ground is plump and free from injury. Fortunately we have in this instance in the roots of the wild form of *Pyrus baccata* a safe basis on which to work, and all of the young trees of the cross-bred apples which have been sent out for test from the Central Experimental Farm have been grafted or budded on this species. Some partial failures have occurred in grafting on this stock which have interfered with rapid distribution, and experience has shown that budding is to be preferred as a method of propagation in this instance. Having at the outset only one small tree to work with the number of grafts available must necessarily be limited, while probably three times the number of buds may be got from the same amount of wood. Not only does budding form a better union with the stock, but it also admits of the trees being multiplied more rapidly.

METHODS OF DISTRIBUTION OF THESE CROSS-BRED FRUITS FOR FURTHER TEST.

Supplies of all these different sorts are sent first to the Experimental Farms at Brandon and Indian Head, where orchards of considerable size are being established. These fruits are also being tested at many different points in Manitoba and the North-west Territories, and at a few places in northern Ontario. To determine their hardiness on the North-west plains it is essential that they be tried in many localities from the eastern boundaries of the plains, where the altitude is comparatively low, to the foothills of the Rocky Mountains, where the elevation above sea-level is much greater. The question of altitude has a most important bearing on the hardiness of fruit trees.

For several years a list has been in course of preparation, on which have been entered from time to time the names of settlers who take a special interest in the growing of trees and shrubs. From this list a number of names were chosen, distributed over a wide area, seldom taking more than one or two in each district. In this way about 200 locations were selected, the extreme points of variation in elevation ranging from 740 to 4,200 feet. Having corresponded with these parties and received assurance that any young trees sent them would be carefully looked after, the first distribution was made in 1902, when four one-year old trees (one tree each of four different sorts) were sent to each person. In the spring of 1903 a second package was sent to the same individuals containing two additional varieties of cross-bred apples, so that at each of these points six of these young trees have been received. Reports have come in from all those who have received the trees, and in almost every instance they are reported as entirely hardy, having stood the winters to which they have been exposed without injury, and as a rule made rapid growth. It is scarcely probable that any of these young trees will fruit in 1905, but in the following year it is likely that many of them will bear apples, when the interest in this work will be very much increased.

OTHER LINES OF WORK UNDERTAKEN.

Another line of work in producing new apples was begun two years ago in crossing *Pyrus malus*, the wild apple of Europe, with some of our best apples. This fruit is about an inch in diameter to start with and of fair quality. A hardy form of this tree has been secured, which has stood several winters at Brandon and Indian Head without injury; and with this during the past two seasons a number of crosses have been made.

Many of the best of the crosses produced on *P. baccata* and *P. prunifolia* have been recrossed, thus introducing a second quota of the blood of the larger apple., with

the hope of obtaining fruits of larger size. How far this can be carried without inducing tenderness can only be determined by experiment. The first one-year old trees produced by this method were planted in the orchard at Ottawa in the spring of 1904.

A very large number of young trees has been raised within the past five years from seed saved from the best of the named cross-bred sorts, and this work is being rapidly extended. Many hundreds of these seedlings have been planted, chiefly in orchards on the western Experimental Farms. Some of these have already fruited, and among them several new sorts of promise have appeared. In raising trees from the seeds of these cross-breds, a large proportion of them will probably sport towards the female parent, *P. baccata,* and produce fruit of an inferior quality, while a small proportion will be likely to inherit more fully the qualities of the male, which would result in larger and better fruit. What proportion will show improvement in this direction can only be determined by growing them, but if only one good variety in a considerable number be had, the inferior ones can all be grafted with the good variety, and time thus saved in building up an orchard.

Many seedlings have also been raised of the Martha, Snyder and other crabs, and several of the seedlings of Martha grown at the Experimental Farm at Brandon have borne fruit of good size and quality, and have thus far been quite hardy.

Of these seedlings, Maggie and No. 309 are among the most promising, and these are being propagated for more extended trial. Including the products from all these different methods of working there are now more than 700 different sorts growing on the Experimental Farm at Ottawa, about 1,200 on the farm at Brandon, and about 650 at Indian Head. There are also the 1,200 trees which have been referred to as growing at 200 different localities in the North-west country.

Grafts of a number of these new seedlings have been sent to some of the leading nurseries in Canada and the opportunity thus afforded of growing stock to meet such demand for these fruits as may arise.

The lines of work in progress may be thus summarized :—

1. The producing of a large number of hybrids by crossing *P. baccata* and *P. prunifolia* with a large number of the best sorts of cultivated apples.

2. The carrying on of similar work with a hardy strain of *Pyrus malus,* the wild crab of Europe.

3. The growing of a large number of trees from seed obtained from the best of the named cross-bred sorts.

4. The producing of a series of second crosses by which the best of the first produced cross-breds will receive another portion of the blood of the larger fruits.

5. The careful testing of every new seedling, or cross-bred fruit, from any and every source, where, associated with acceptable size and quality, there is promise of hardiness.

By persevering along the lines indicated there is little doubt that within a very few years a number of varieties of apples will be available, possessing that hardiness, size and quality which will commend them to the settlers in all those portions of the northern country where ordinary apples under average conditions cannot be grown. The success thus far achieved is most encouraging, and doubtless greater triumphs in the future will reward persistent effort.

CO-OPERATIVE EXPERIMENTS BY CANADIAN FARMERS.

The assistance rendered to Canadian farmers by the distribution of samples of seed of high quality for the improvement of crops has been continued, and the work

highly appreciated. Farmers everywhere have gladly undertaken to co-operate with the Experimental Farms in the endeavour to ascertain the relative merits in earliness, productiveness and quality of the different varieties under trial, when grown under the different climatic conditions which prevail in the several provinces and territories of the Dominion. During 1904 more than 37,000 farmers joined in these co-operative tests. A large number of reports have been received in which many have expressed their gratitude for the efforts made in their behalf, and their appreciation of the great value of this work. The samples of wheat and barley sent to each applicant have weighed five pounds each, and those of oats four pounds, sufficient in each case to sow one-twentieth of an acre. The samples of Indian corn, pease and potatoes have weighed three pounds each.

The samples sent from the Central Experimental Farm during the early months of 1904 have been distributed as follows :—

DISTRIBUTION BY PROVINCES.

Name of Grain.	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	North-west Territories.	British Columbia.
Oats	603	1,350	1,319	3,316	2,212	891	1,395	135
Barley	136	514	297	1,201	893	334	540	66
Wheat	395	795	908	1,711	790	977	1,658	82
Pease	23	121	140	328	94	54	67	19
Indian corn	46	189	175	831	687	47	158	26
Potatoes	116	620	748	1,574	2,155	760	1,124	202
Total	1,319	3,589	3,587	8,961	6,831	3,063	4,942	530

Total number of samples distributed, 32,822.

Number of applicants supplied, 32,756.

Total number of packages of each sort distributed :—

Oats	11,221
Barley	3,981
Wheat	7,316
Pease	846
Indian corn	2,159
Potatoes	7,299
Total	32,822

The following list shows the number of packages which have been sent out of the different varieties :—

Name of Variety.	Number of Packages.	Name of Variety.	Number of Packages.
OATS.		PEASE.	
Banner	2,765	Canadian Beauty	516
Improved Ligowo	1,976	Prussian Blue	195
Tartar King	1,828	Arthur	52
Waverley	1,328	Miscellaneous	83
Wide Awake	807	Total	846
Goldfinder	759		
Abundance	679	INDIAN CORN.	
Thousand Dollar	504	Angel of Midnight	653
Black Beauty	333	Selected Leaming	508
American Beauty	242	Early Mastodon	423
Total	11,221	Compton's Early	222
BARLEY (Six-rowed).		Longfellow	207
Mensury	1,228	Superior Fodder	90
Odessa	686	Eureka	56
Mansfield	218	Total	2,159
Claude	171		
Rennie's Improved	162	POTATOES.	
Royal	44	Carman No. 1	887
(Two-rowed).		American Wonder	723
Sidney	533	Rural Blush	606
Canadian Thorpe	333	Early White Prize	583
Standwell	333	Everett	548
Invincible	273	Rochester Rose	535
Total	3,981	Reeve's Rose	449
WHEAT.		Early Andes	448
Red Fife	1,765	Canadian Beauty	434
Preston	1,602	Early Sunrise	399
Percy	811	Early Ohio	394
Stanley	777	Late Puritan	334
Laurel	668	Uncle Sam	264
White Fife	575	Wonder of the World	236
Huron	471	Beauty of Hebron	192
White Russian	280	Thorburn	106
Wellman's Fife	197	Miscellaneous	161
White Connell	167	Total	7,299
Common Emmer	3		
Total	7,316		

DISTRIBUTION OF SAMPLES FROM THE BRANCH EXPERIMENTAL FARMS.

Samples were also distributed from the Branch Experimental Farms, as follows:—

Experimental Farm, Nappan, N.S.	No. of Sample Bags.	Experimental Farm, Brandon, Man.	No. of Sample Bags
Spring wheat	72	Spring wheat	134
Oats	198	Oats	166
Barley	65	Barley	60
Pease	51	Pease	49
Buckwheat	25	Potatoes	128
Potatoes	331		
Total	742	Total	537

Experimental Farm, Indian Head, N.W.T.

	No. of Sample Bags.
Spring wheat	420
Oats	542
Barley	367
Pease	176
Flax, Rye and Emmer	153
Potatoes	818
Total	2,476

Experimental Farm, Agassiz, B.C.

	No. of Sample Bags.
Spring wheat	86
Oats	153
Barley	74
Pease	120
Potatoes	164
Total	597

By adding the number of samples distributed by the branch farms to those sent out by the central farm, we have a total of 37,174. It is gratifying to find among the farmers of Canada so large a number of volunteers ready to co-operate in this experimental work.

For ten years the volume of this work has been large, and the average number of experimenters to whom samples have been sent has been 36,406 each year.

In distributing this large quantity of seed grain great care is taken to have it clean and as far as possible true to name. Most of it is grown at the Experimental Farms at Indian Head and Brandon, where the crops average larger yields than they do at Ottawa. It is believed that better results can be got from samples of oats from a crop which has given 100 bushels per acre than from one giving 50 or 60 bushels. There is much individuality stamped on every variety, and it is doubtless an advantage to have seed grain from productive strains.

To provide the large quantity of seed required for this distribution, arrangements are made for growing it the previous year. While maturing in the fields most of the grain from which the samples for distribution are to be supplied is gone carefully over, and any plants found of other varieties pulled up. After the grain is threshed it is put through suitable cleaning machinery, and then thoroughly examined, and if any foreign admixture which the separators will not remove is found the grain is hand picked before it is sent out. There is no doubt that the high quality and productiveness of the cereals grown throughout the Dominion has been favourably influenced and very largely so by the placing of these comparatively small quantities of cereals of high quality in the hands of so many good men. From the samples received hundreds of farmers have within three seasons produced sufficient seed for their own sowing and a considerable surplus to sell to their neighbours.

CORRESPONDENCE.

The correspondence carried on during 1904 between the farmers of Canada and the officers of the Experimental Farms has been very large.

CENTRAL EXPERIMENTAL FARM.

The following is a summary of the letters received and sent out at the Central Experimental Farm from December 1, 1903, to November 30, 1904; also the number of reports, bulletins and circulars forwarded by mail during the same period:—

	Letters received.	Letters sent.
Director	43,791	18,539
Agriculturist	2,067	2,967
Horticulturist	1,479	1,417
Chemist	1,284	1,251
Entomologist and Botanist	3,231	2,909
Experimentalist	349	281
Poultry Manager	2,298	2,006
Accountant	867	873
	55,366	30,243

A large number of the letters received by the Director are applications for samples of grain or for the publications of the farms, a considerable proportion of which are answered by sending the correspondents the material asked for, accompanied by circular letters. This explains why the number of letters received so much exceeds the number sent out.

Circular letters, including circulars sent with samples of seed grain	33,825
Reports and bulletins mailed	345,853

BRANCH EXPERIMENTAL FARMS.

The correspondence with the superintendents of the branch experimental farms is also large, as shown by the following figures:—

	Letters received.	Letters sent.
Experimental Farm, Nappan, N.S.	2,030	1,790
" " Brandon, Man.	5,300	3,528
" " Indian Head, N.W.T.	5,849	5,871
" " Agassiz, B.C.	2,942	2,772

Much additional information has also been sent out from the branch farms in printed circulars. By adding the correspondence conducted at the branch farms to that of the central farm, it will be seen that 71,487 letters in all were received, and 44,204 sent out during the year.

TESTS OF THE VITALITY OF SEED GRAIN AND OTHER SEEDS.

The number of samples of seeds tested during the season of 1903-4 to find the proportion which would germinate, and to determine the percentage of plants of strong and weak growth, was 2,285.

This useful work has been carried on at the Central Experimental Farm every year since its establishment in 1887. The total number of samples tested since that time is 31,736. Farmers are invited to send in every year any samples which may be of doubtful vitality through injury before harvest or in harvesting or storing, so that their germinating power may be determined and their usefulness for seed puposes ascertained. The appliances available for these tests are all that could be desired, affording facilities for testing every sample in the soil, and also in germinators where the grain is placed between folds of linen or other fabric and kept constantly moist. In our experience there is no test so reliable as the soil, and it has often occurred when testing samples of low vitality in a germinator that the proportion of seeds which will start to grow between the moist folds of fabric in the apparatus will be larger than can be got from the same seed put into the soil. The information which is of practical use to the farmer is the proportion of seed which will grow in his fields when sown there. If the vitality of a sample is so weak that a large proportion of the young plants are unable to force their way through the soil, such seed, however high the percentage of germination shown in the germinator, is of less value for sowing.

During the past season 820 samples of oats have been tested, a large number of which were sent in from Northern Alberta, where the oat crop of 1903 was considerably injured by frost. In all cases where the germinating power was low, farmers were advised to dispose of such grain for feed and to buy oats of higher vitality for sowing. Many instances have come to our knowledge where such information supplied has saved farmers from much loss.

Any farmer may avail himself of the help which this branch of the work can give him; about an ounce of seed is all that is needed to allow of its germinating power

being determined. No charge is made for testing samples, and they may be sent to the Central Experimental Farm by mail free of postage and can usually be reported on in about a fortnight.

RESULTS of Tests of Seeds for Vitality, 1903-4:—

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	679	100·0	17·0	81·6	4·6	86·2
Barley	269	100·0	22·0	83·2	6·9	90·1
Oats	820	100·0	1·0	60·3	10·0	*70·3
Rye	2	94·0	88·0	89·0	2·0	91·0
Pease	164	100·0	6·0	....	....	64·6
Grass	117	100·0	7·0	....	....	74·5
Clover	186	100·0	17·0	....	....	76·3
Corn	13	94·0	20·0	....	....	62·1
Radish	5	72·0	17·0	....	....	40·0
Sugar Beet	3	82·0	74·0	....	....	78·0
Cabbage	3	75·0	57·0	....	....	66·0
Tobacco	2	54·0	47·0	....	....	50·5
Ash Seed	2	14·0	10·0	....	....	12·0
Maple Seed	2	20·0	16·0	....	....	18·0
Rape	1	99·0	99·0	....	....	99·0
Miscellaneous vegetable seeds	17	100·0	10·0	....	....	49·8
Total number of samples tested, highest and lowest percentage	2,285	100·0	1·0	....	....	....

TABLE showing Results of Grain Tests for each Province:—

ONTARIO.

Kind of Grain.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	222	100·0	23·0	74·8	5·5	80·4
Barley	113	100·0	39·0	81·6	7·2	88·8
Oats	127	100·0	1·0	87·1	5·1	92·2

QUEBEC.

Kind of Grain.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	45	100·0	53·0	88·4	3·3	91·7
Barley	17	100·0	58·0	87·5	7·5	95·0
Oats	21	100·0	47·0	83·5	5·9	89·5

MANITOBA.

Kind of Grain.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	155	100·0	38·0	86·3	4·0	90·3
Barley	33	100·0	22·0	86·1	4·5	90·6
Oats	159	100·0	6·0	74·7	8·3	83·1

NORTH-WEST TERRITORIES.

Kind of Grain.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	170	100·0	23·0	80·2	5·2	85·4
Barley	76	100·0	26·0	83·2	5·7	88·9
Oats	481	100·0	3·0	45·6	12·3	*58·0

* This low average percentage in oats is due to the number of samples injured by unfavourable weather received from Northern Alberta. These samples ranged in vitality from 3 per cent and upwards. In other localities in the north-west the percentage of vitality ranged from 75 to 100 per cent.

1.—ALBERTA. 2.—TONY.

NOVA SCOTIA.

Wheat	30	100·0	60·0	87·4	2·4	89·9
Barley	10	100·0	86·0	83·1	11·9	95·0
Oats	9	98·0	67·0	81·1	5·7	86·7

NEW BRUNSWICK.

Wheat	31	100·0	17·0	89·0	2·9	91·9
Barley	10	99·0	86·0	84·5	12·1	96·6
Oats	10	99·0	89·0	87·9	6·8	94·7

PRINCE EDWARD ISLAND.

Wheat	20	100·0	86·0	92·6	2·7	95·3
Barley	8	100·0	83·0	86·3	7·6	94·0
Oats	10	100·0	91·0	92·1	4·3	96·4

BRITISH COLUMBIA.

Wheat	6	100·0	79·0	92·3	1·5	93·8
Barley	2	87·0	86·0	70·6	16·0	86·5
Oats	3	89·0	78·0	77·0	7·3	84·3

(Signed) WILLIAM T. ELLIS.

METEOROLOGICAL OBSERVATIONS.

TABLE of Meteorological Observations taken at the Central Experimental Farm, Ottawa, 1904; maximum, minimum and mean temperature for each month, with date of occurrence, also rainfall, snowfall and total precipitation.

Month.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of Days Precipitation.	Heaviest in 24 hours.	Date.
	°	°	°	°	°		°							
January	13·90	—4·91	18·82	4·50	30·5	31st	—30·2	5th	0·00	40·75	4·06	12	0·80	16th.
February	15·23	—5·66	20·89	4·78	38·0	22nd	—28·0	2nd	0·39	24·00	2·79	13	0·55	23rd.
March	32·49	14·66	17·83	23·57	42·8	23rd	—12·0	5th	2·09	13·75	3·46	16	0·83	26th.
April	47·15	30·01	17·14	38·58	66·0	24th	6·2	2nd	3·36	6·00	3·96	13	1·00	9th.
May	71·31	46·82	24·49	59·06	85·0	9th	35·2	12th	3·49	.....	3·49	10	0·88	15th.
June	75·98	53·82	22·16	64·90	87·5	25th	46·0	23rd	2·80	......	2·80	14	0·49	15th.
July	78·86	56·34	22·51	67·59	95·0	19th	44·5	30th	3·31	.....	3·31	16	1·14	31st.
August	75·98	52·52	23·45	64·24	83·5	5th	42·8	30th	2·80	......	2·80	13	1·68	20th.
September	64·95	45·34	19 60	55·14	80·0	11th	27·5	22nd	5·50	......	5·50	15	1·58	24th.
October	53·31	34·76	18·55	44·03	70·1	10th	19·0	31st	1·80	......	1·80	10	0·72	21st.
November	36·27	22·10	14·17	29·18	52·0	3rd	0·0	29th	0·41	4·75	0·88	10	0·22	27th.
December	16·72	-1·03	17·76	7·85	35·7	31st	—20·6	25th	T	19·50	1·94	15	0·50	19th.

Rain or snow fell on 157 days during the 12 months.
Heaviest rainfall in 24 hours, 1·68 inches, on August 20th.
Heaviest snowfall in 24 hours, 8·00 inches, on January 16th.
The highest temperature during the 12 months, was 95·0° on July 19th.
The lowest temperature during the 12 months, was—30·2° on January 5th.

During the growing season rain fell on 13 days in April, 10 days in May, 14 days in June, 16 days in July, 13 days in August, and 15 days in September.

May, October and November, show the lowest number of days with precipitation, viz., 10 days in each month.

Total precipitation during the 12 months, 36·79 inches, as compared with 34·92 inches during 1903.

RAINFALL, Snowfall, and total Precipitation from 1890 to 1904, also the average annual amount that has fallen.

Year.	Rainfall.	Snowfall.	Total Precipitation
	In inches.	In inches.	In inches.
1890	24·73	64·85	31·22
1891	30·19	73·50	37·54
1892	23·78	105·00	34·28
1893	31·79	72·50	39·04
1894	23·05	71·50	30·20
1895	27·01	87·50	35·76
1896	21·53	99·75	31·50
1897	24·18	89·00	33·08
1898	24·75	112·25	35·97
1899	33·86	77·25	41·63
1900	29·48	108·00	40·27
1901	29·21	97·25	38·91
1902	25·94	101·75	36·10
1903	26·43	85·00	34·92
1904	25·95	108·75	36·79
Total for 15 years	401·88	1,353·85	537·21
Yearly average for 15 years	26·79	90·25	35·81

RECORD of Sunshine taken at the Central Experimental Farm, Ottawa, for the Year 1904.

Months.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
January	14	17	65·1	2·10
February	19	10	97·0	3·34
March	24	7	129·4	4·17
April	21	9	129·4	4·31
May	28	3	233·8	7·54
June	27	3	236·4	7·88
July	29	2	224·0	7·22
August	28	3	252·2	8·13
September	25	5	145·3	4·84
October	24	7	107·2	3·45
November	22	8	99·0	3·30
December	19	12	70·6	2·27
Total	....	....	1,789·4	....

(Sgd.) WILLIAM T. ELLIS,
Observer.

SPECIAL EXPERIMENTS WITH FERTILIZERS.

In the annual report of the experimental farms for 1893, details were given on pages 8 to 24 of the results of a series of tests which had then been carried on for some years with the object of gaining information regarding the effects which follow the application of certain fertilizers and combinations of fertilizers on the more important farm crops. The particulars there given covered the results of six years' experience with crops of wheat and Indian corn, and five years' experience with crops of oats, barley, turnips and mangels. The results of similar tests conducted for three years with carrots and one year with sugar beets were also given.

These experiments have been continued, and a summary of the results obtained has been given each year, taking the average yield of crops from the beginning, adding the results for the current year, and then giving the average yield for the full time. These tests were undertaken on virgin soil, on a piece of land which was cleared for the purpose. For particulars regarding the clearing and preparing of the land for crop in 1887-88 and its subsequent treatment, the reader is referred to the earlier issues of this report.

OBJECT IN VIEW IN CONDUCTING THESE EXPERIMENTS.

In establishing and conducting this series of experiments, the object in view has been to gain information as to the effects produced by certain fertilizers and combinations of fertilizers on particular crops. They were never intended to serve as model test plots such as farmers could copy with advantage in their general practice. On the contrary, to gain the information desired, it has been found necessary to use some fertilizers in unusual quantities, and in other instances to more or less exhaust the soil by a succession of crops of the same sort, practices which in ordinary farming would be extravagant or detrimental. From this long conducted series of tests much useful information has been gained, which appeals to the mind with greater force as experience accumulates from year to year.

VALUABLE INFORMATION GAINED.

These trials have shown that barn-yard manure can be most economically used in the fresh or unrotted condition; that fresh manure is equal, ton for ton, in crop-producing power to rotted manure, which, other experiments have shown, loses during the process of rotting about 60 per cent of its weight. In view of the vast importance of making the best possible use of barn-yard manure, it is difficult to estimate the value of this one item of information.

When these experiments were planned, the opinion was very generally held that untreated mineral phosphate, if very finely ground, was a valuable fertilizer, which gradually gave up its phosphoric acid for the promotion of plant growth. Ten years' experience has shown that mineral phosphate, untreated, is of no value as a fertilizer.

The use of sulphate of iron, which at the time these tests were begun, was highly recommended, as a means of producing increased crops, has also been proven to be of very little value for this purpose.

Common salt, which has long had a reputation with many farmers for its value as a fertilizer for barley, while others disbelieved in its efficacy, has been shown to be a most valuable agent for producing an increased crop of that grain, while it is of much less use when applied to crops of spring wheat or oats. Land plaster or gypsum has also proven to be of some value as a fertilizer for barley, while of very little service for wheat or oats. Some light has also been thrown on the relative usefulness of single and combined fertilizers.

CHANGES MADE IN THE EXPERIMENTS.

After ten years' experience had demonstrated that finely-ground, untreated mineral phosphate was of no value as a fertilizer, its use was discontinued in 1898. Prior to this it had been used in each set of plots in Nos. 4, 5, 6, 7 and 8, in all the different series of plots, excepting roots. In 1898 and 1899, similar weights of the Thomas' phosphate were used in place of the mineral phosphate, excepting in plot 6 in each series. In this plot the Thomas' phosphate was used in 1898 only.

After constant cropping for ten or eleven years, it was found that the soil on those plots to which no barn-yard manure had been applied was much depleted of humus, and hence its power of holding moisture had been lessened ,and the conditions for plant growth, apart from the question of plant food, had on this account become less favourable. In 1899 the experiments were modified and an effort made to restore some proportion of the humus and at the same time gain further information as to the value of clover as a collector of plant food. In the spring of that year ten pounds of red clover seed per acre was sown with the grain on all the plots of wheat, barley and oats. The young clover plants made rapid growth, and by the middle of October there was a thick mat of foliage varying in height and density on the different plots, which was ploughed under.

In 1900, 1901, 1902, 1903 and 1904, clover was again sown on all the grain plots, and was ploughed under in October. In 1900 and 1901 a good growth of clover was obtained, but in 1902 a severe frost in the spring destroyed a large proportion of the young plants, so that the crop available for ploughing under in the autumn was very light. In 1903 and 1904 the crop of clover ploughed under in the autumn was fairly good.

APPLICATION OF FERTILIZERS DISCONTINUED.

Another direction in which information was sought was in reference to the length of time which a liberal application of barn-yard manure would continue to affect subsequent crops, and in 1899 on plots 1, 2 and 6 the barn-yard manure, which had been used for ten or eleven years in succession, was discontinued. The phosphate fertilizer was also omitted on plot 6 in each series.

In 1900 all the fertilizers on all the plots were discontinued, and since then the same crops have been grown on all these plots from year to year without fertilizers, sowing clover with the grain each season. In this way some information has been gained as to the value of clover as a collector of plant food, and also as to the unexhausted values of the different fertilizers which have been used on these plots since the experiments were begun.

SPECIAL TREATMENT OF PLOTS OF INDIAN CORN AND ROOTS.

As it was not practicable to sow clover with the Indian corn and root crops, the sowing of these latter crops was discontinued in the spring of 1900 and clover sown in their place in the proportion of 12 pounds per acre. The clover on these plots made strong growth, so strong as to necessitate twice cutting during the season, the cut clover being left on the ground in each case to decay and add to the fertility of the soil. The clover was left over for further growth in the spring of 1901, and ploughed under for the roots about May 10, and for corn about the middle of that month. Then roots and Indian corn were again sown. In 1902 crops of Indian corn and roots were grown on these plots, but in 1903 the land was again devoted to clover.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of 1½ bushels per acre, excepting in 1894; and the varieties used were as follows:—

In 1888 to 1891, White Russian, and in 1892-3, Campbell's White Chaff. In 1894, the Rio Grande wheat was used, when, owing to lack of germinating power in the seed, a larger quantity was required. From 1895 to 1904 inclusive, Red Fife wheat was used in the usual quantity of 1½ bushels per acre. In 1904 the Red Fife was sown May 6, and was ripe August 18.

TABLE I.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT.

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Sixteen Years. Yield of Grain. Per acre.		Average Yield for Sixteen Years. Yield of Straw. Per acre	17th Season, 1904. Variety, Red Fife. Yield of Grain. Per acre.		17th Season, 1904. Variety, Red Fife. Yield of Straw. Per acre	Average Yield for Seventeen Years. Yield of Grain. Per acre.		Average Yield for Seventeen Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure has been applied since then....	22	$23\frac{12}{16}$	4,022	26	20	2,750	22	$37\frac{16}{17}$	3,947
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure has been applied since then	22	$38\frac{11}{16}$	4,053	26	10	2,880	22	$50\frac{8}{17}$	3,985
3	Unmanured from the beginning......... .	11	$37\frac{8}{16}$	1,978	13	10	1,290	11	$42\frac{16}{17}$	1,937
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizers have been applied since then	12	$4\frac{1}{16}$	2,107	17	40	1,250	12	$23\frac{14}{17}$	2,056
5	Mineral phosphate, untreated, finely ground, 500 lbs. nitrate of soda, 200 lbs. per acre used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then......................	12	$58\frac{7}{16}$	2,773	19	..	1,190	13	$19\frac{12}{17}$	2,680
6	Barn-yard manure, partly rotted and actively fermenting, six tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897 inclusive. In 1898, 500 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then................................	19	$22\frac{6}{16}$	3,317	21	10	2,510	19	$28\frac{12}{17}$	3,270
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.....................	13	$38\frac{3}{16}$	2,607	17	40	2,310	13	$52\frac{7}{17}$	2,590

TABLE I.—EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT—*Concluded.*

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Sixteen Years. Yield of Grain. Per acre.		Average Yield for Sixteen Years. Yield of Straw. Per acre	17th Season, 1904. Variety, Red Fife. Yield of Grain. Per acre.		17th Season, 1904. Variety, Red Fife. Yield of Straw. Per acre	Average Yield for Seventeen Years. Yield of Grain. Per acre.		Average Yield for Seventeen Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then	11	$34\frac{9}{16}$	2,218	16	40	2,390	11	50	2,226
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	12	$22\frac{11}{16}$	1,986	15	20	2,250	12	$33\frac{2}{17}$	2,002
10	Mineral superphosphate, No. 1, 350l bs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	13	$27\frac{4}{16}$	2,953	13	40	2,640	13	28	2,935
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. No fertilizers have been applied since then	14	$24\frac{11}{16}$	2,900	14	10	2,270	14	$23\frac{14}{17}$	2,863
12	Unmanured from the beginning	10	$31\frac{14}{16}$	1,943	13	10	1,400	10	$41\frac{3}{17}$	1,911
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	12	$42\frac{1}{16}$	2,103	14	20	1,770	12	$47\frac{14}{17}$	2,083
14	Bone, finely ground, 500 lbs.; wood ashes unleached, 1,500 lbs. per acre; used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	15	$26\frac{14}{16}$	2,681	17	..	1,840	15	$32\frac{6}{17}$	2,632
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	14	15	2,496	16	..	2,100	14	$21\frac{5}{17}$	2,472
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	15	$43\frac{15}{16}$	2,282	14	30	2,280	15	$39\frac{12}{17}$	2,282
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	13	$1\frac{11}{16}$	2,432	13	40	3,170	13	$3\frac{12}{17}$	2,475
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	12	$50\frac{15}{16}$	2,019	13	30	2,030	12	$53\frac{4}{17}$	2,020
19	Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	13	$47\frac{7}{16}$	1,667	15	40	1,470	13	$54\frac{1}{17}$	1,655
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	12	$53\frac{15}{16}$	1,989	12	50	1,600	12	$53\frac{13}{17}$	1,966
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been used since then	13	$16\frac{8}{16}$	1,984	12	30	1,580	13	$13\frac{13}{17}$	1,960

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was 2 bushels in 1889 to 1891, $1\frac{1}{2}$ bushels in 1892 and 1893, and 2 bushels from 1894 to 1904, inclusive. Two-rowed barley was used for seed throughout until 1902, when Mensury, a six-rowed sort, was tried. The varieties used were as follows: 1889 to 1891, Saale; 1892, Goldthorpe; 1893, Duck-bill; and in 1894 to 1901, Canadian Thorpe, a selected form of the Duck-bill. Since 1902 Mensury has been sown. In 1904 it was sown May 6, and was harvested on July 30.

TABLE II.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY.

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fifteen Years.			16th Season, 1904. Variety, Mensury.			Average Yield for Sixteen Years.		
		Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year to 1898, inclusive. No manure has been applied since then......	35	$25\frac{7}{15}$	3,060	42	4	2,860	35	$45\frac{2}{16}$	3,047
2	Barn-yard manure, fresh, 15 tons per acre each year to 1898, inclusive. No manure has been applied since then.	35	$14\frac{14}{15}$	3,234	41	2	2,660	35	$32\frac{2}{16}$	3,198
3	Unmanured from the beginning..........	14	$28\frac{13}{15}$	1,537	16	42	1,430	14	$35\frac{11}{16}$	1,539
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizers have been applied since then........	15	$44\frac{8}{15}$	1,510	17	44	1,660	16	$2\frac{8}{16}$	1,519
5	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then............	21	$10\frac{3}{15}$	2,219	22	14	1,800	21	$13\frac{6}{16}$	2,193
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.....................	28	$26\frac{2}{15}$	2,396	37	4	2,720	29	$3\frac{12}{16}$	2,416
7	Mineral phosphate, untreated, finely ground, 500 lbs. nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then	26	$12\frac{13}{15}$	2,377	35	10	2,760	26	$39\frac{11}{16}$	2,401

TABLE II.—EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY—*Concluded.*

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fifteen Years.			16th Season, 1904. Variety, Mensury.			Average Yield for Sixteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then........	21	37	1,835	35	30	2,070	22	$30\frac{9}{16}$	1,850
9	Mineral superphosphate, No. 1, 500 lbs. per acre used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then	21	$26\frac{5}{15}$	1,729	28	46	1,280	22	$0\frac{9}{16}$	1,701
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..................................	28	4	2,359	25	40	1,770	27	$45\frac{4}{16}$	2,322
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	27	$1\frac{5}{15}$	2,481	32	14	2,170	27	$17\frac{2}{16}$	2,462
12	Unmanured from the beginning........ ..	14	$12\frac{5}{15}$	1,228	17	24	1,420	14	$22\frac{1}{16}$	1,240
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	15	15	1,421	21	22	1,560	15	$33\frac{7}{16}$	1,430
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	24	$1\frac{5}{15}$	2,089	27	34	2,630	24	$12\frac{6}{16}$	2,123
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	22	$7\frac{10}{15}$	2,270	19	8	1,530	21	$46\frac{11}{16}$	2,224
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	22	$40\frac{10}{15}$	1,859	23	36	1,430	22	$43\frac{11}{16}$	1,832
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	19	$16\frac{7}{15}$	1,933	19	38	1,450	19	$17\frac{13}{16}$	1,903
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	18	$44\frac{10}{15}$	1,656	20	..	1,290	18	$47\frac{14}{16}$	1,633
19	Common salt (Sodium chloride) 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..........	27	19	1,892	23	26	1,510	27	$7\frac{7}{16}$	1,868
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then......	20	24	1,591	22	34	1,780	20	$30\frac{10}{16}$	1,603
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizers have been applied since then....	21	$9\frac{9}{15}$	1,770	24	18	1,580	21	$19\frac{2}{16}$	1,758

OAT PLOTS.

The quantity of seed sown per acre on the oat plots was 2 bushels in 1889 and 1890; 1½ bushels in 1891 to 1893, and 2 bushels from 1894 to 1904, inclusive. The varieties used were as follows: In 1889, Early English; in 1890 to 1893, Prize Cluster; and from 1894 to 1904, inclusive, the Banner. In 1904 Banner was sown April 22 and the plots were harvested August 17.

TABLE III.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS.

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fifteen Years.			16th Season, 1904. Variety, Banner.			Average Yield for Sixteen Years.		
		Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year to 1898, inclusive. No manure has been applied since then......	51	$11\frac{10}{15}$	3,226	57	12	3,040	51	$24\frac{7}{16}$	3,214
2	Barn-yard manure, fresh, 15 tons per acre each year to 1898, inclusive. No manure has been applied since then.......... ..	55	$17\frac{5}{15}$	3,368	58	18	3,110	55	$23\frac{12}{16}$	3,352
3	Unmanured from the beginning.....	34	$11\frac{10}{15}$	1,715	42	12	2,660	34	$28\frac{1}{16}$	1,774
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No. fertilizers have been applied since then	34	$26\frac{14}{15}$	1,844	51	6	26 10	35	$27\frac{10}{16}$	1,892
5	Mineral phosphate, untreated, finely ground, 500 lbs. nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then......	48	$25\frac{1}{15}$	2,661	58	28	2,450	49	$12\frac{12}{16}$	2,648
6	Barn-yarn manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898 500 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then..	48	$5\frac{5}{15}$	2,738	60	30	2,850	48	$32\frac{6}{16}$	2,745
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.....	49	$4\frac{3}{15}$	3,143	53	18	2,800	49	$13\frac{14}{16}$	3,121
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then..	43	$22\frac{5}{15}$	2,498	58	18	2,900	44	$19\frac{15}{16}$	2,523
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been used since then..	38	$5\frac{10}{15}$	1,976	50	10	2,340	38	$31\frac{7}{16}$	1,999

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS—*Continued.*

No. of Plot.	Fertilizers applied each year, from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fifteen Years.			16th Season, 1904. Variety, Banner.			Average Yield for Sixteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..................	46	32	2,680	54	24	2,130	47	14$\frac{8}{16}$	2,645
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897, inclusive. No fertilizers have been applied since then......	39	..$\frac{9}{15}$	2,427	37	32	2,650	38	31$\frac{14}{16}$	2,441
12	Unmanured from the beginning	23	28$\frac{5}{15}$	1,426	25	..	1,540	23	30$\frac{13}{16}$	1,433
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	34	28$\frac{5}{15}$	2,023	46	26	1,730	35	19$\frac{11}{16}$	2,005
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	41	18$\frac{10}{15}$	2,297	50	20	2,350	41	3$\frac{14}{16}$	2,300
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	47	6	2,746	43	28	2,480	46	32$\frac{14}{16}$	2,729
16	Muriate of potash, 150 lbs. per acre, used each year from 1898 to 1899 inclusive. No fertilizers have been applied since then..	39	5$\frac{10}{15}$	2,218	54	24	2,210	40	4$\frac{11}{16}$	2,217
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	45	13$\frac{5}{15}$	2,794	54	4	2,340	45	32$\frac{1}{16}$	2,766
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	39	—$\frac{11}{15}$	1,985	47	32	2,630	39	13$\frac{11}{16}$	2,025
19	Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then...........................	38	15	1,929	53	28	2,690	39	13$\frac{11}{16}$	1,976
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then...........	34	32	1,966	46	26	2,610	35	23$\frac{2}{16}$	2,060
21	Mineral superphosphate, No. 2, 500 lbs per acre, used each year from 1889 to 1899, inclusive. No fertilizers have been applied since then.	35	17	1,859	51	26	2,580	36	17$\frac{9}{16}$	1,904

The one-tenth acre plots of wheat, barley and oats had by the end of 1903 become infested with several troublesome perennial weeds, hence it was thought best to sow only one-half of each plot with grain in 1904, devoting the other half to a hoed crop to clean it. On this account no clover was sown on any of the cereal plots in 1904, and one-half of the wheat plots was sown with mangels, one-half of the barley plots with potatoes, and one-half of the oat plots with carrots, computing the yields of grain from a one-twentieth acre plot in each case.

INDIAN CORN PLOTS.

The experiments with the plots of Indian corn have been conducted with the object of obtaining the largest weight of well matured green fodder for the silo, and to have the corn so far advanced when cut, that the ears shall be as far as is practicable in the late milk or glazed condition. Each plot has been divided from the outset into two equal parts, on one of which—known as No. 1—one of the stronger growing and somewhat later ripening sorts has been tried, and on the other, marked No. 2, one of the earlier maturing varieties. During the first four years one of the Dent varieties was tested under No. 1. The Mammoth Southern Sweet was tried in 1888 to 1890. In 1891 the Red Cob Ensilage was used, and in 1892 to 1902 the Rural Thoroughbred White Flint was tested. On the other half of the plot (No. 2) the Canada Yellow Flint was used in 1888 to 1890, the Thoroughbred White Flint in 1891, Pearce's Prolific in 1892 to 1894, and the Mammoth Eight-Rowed Flint in 1895 to 1902. For the first four years the No. 1 series was planted in drills 3 feet apart, using about 24 pounds of seed to the acre and thinning the plants, when up, to 6 or 8 inches, and the No. 2 in hills 3 feet apart each way with 4 or 5 kernels in a hill. During the past seven years both sorts have been grown in hills.

In 1900 no crop of Indian corn was grown on these plots, but clover was sown in its place on May 5 in the proportion of 12 pounds per acre. This made a strong growth, was cut twice during the season and left on the ground to decay, so that when ploughed under, the land might get the full benefit of the clover crop. The clover was allowed to remain growing until May 20, 1901. It was then ploughed under about 6 inches deep, and harrowed well before the corn was planted. Clover was sown again in 1903, and ploughed under in May, 1904. The corn was planted in 1904, on June 6, and cut for ensilage September 26.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN, CUT GREEN FOR ENSILAGE.

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1900 in place of the corn and ploughed under in May, 1901, before the corn was planted. In 1903 clover was again sown and ploughed under in May, 1904.	Average Yield for Fourteen Years.				15th Season, 1904.				Average Yield for Fifteen Years.			
		Plot No. 1—½ weight of green fodder. Per acre.		Plot No. 2—½ weight of green fodder. Per acre		Plot No. 1—½ Selected Leaming, weight of green fodder. Per acre.		Plot No. 2—½ Angel of Midnight, weight of green fodder. Per acre		Plot No. 1—½ weight of green fodder. Per acre.		Plot No. 2—½ weight of green fodder. Per acre	
		Tons.	lbs.	Tons	lbs	Tons	lbs.	Tons	lbs	Tons	lbs.	Tons	lbs
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre, each year from 1888 to 1898 inclusive. No manure has been applied since then..	16	757	13	167	16	1,460	14	640	16	804	13	332
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre each year from 1888 to 1898 inclusive. No manure has been applied since then............	16	627	11	941	16	130	13	240	16	594	11	1,161
3	Unmanured from the beginning..........	7	28	5	209	9	1,600	9	1,470	7	399	5	826
4	Mineral phosphate, untreated, finely ground, 800 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizers have been applied since then....................	7	1,749	4	1,844	13	540	13	40	8	468	5	924

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN—*Continued.*

No. of Plot.	Fertilizers applied each year, from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1900 in place of the corn and ploughed under in May, 1901, before the corn was planted. In 1903 clover was again sown and ploughed under in May, 1904.	Average Yield for Fourteen Years.				15th Season, 1904.				Average Yield for Fifteen Years.			
		½ Plot No. 1—weight of green fodder.		½ Plot No. 2—weight of green fodder.		½ Plot No. 1—Selected Leaming, weight of green fodder.		½ Plot No. 2—Angel of Midnight, weight of green fodder.		½ Plot No. 1—weight of green fodder.		½ Plot No. 2—weight of green fodder.	
		Per acre.		Per acre		Per acre.		Per acre		Per acre.		Per acre	
		Tons.	lbs.	Tons.	lbs	Tons.	lbs.	Tons.	lbs	Tons.	lbs.	Ton	lbs
5	Mineral phosphate, untreated, finely ground, 800 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 800 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then	11	703	8	1,874	15	1,820	14	440	11	1,311	9	578
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897 inclusive. In 1898 500 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then	16	493	11	1,861	16	190	15	260	16	473	12	288
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then	15	499	11	355	14	1,750	13	930	15	449	11	660
8	Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs., per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then	12	150	9	637	15	360	14	460	12	564	9	1,292
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	11	483	8	1,315	13	600	11	350	11	757	8	1,651
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	13	1,105	10	1,034	13	430	12	40	13	1,060	10	1,234
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	16	526	12	613	16	620	15	520	16	532	12	1,007
12	Unmanured from the beginning	10	1,970	8	1,979	12	160	11	1,430	11	116	9	342
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	12	371	9	784	13	880	12	1,110	12	538	9	1,206
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	12	1,690	9	1,755	14	1,150	13	580	12	1,921	10	210
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	12	1,317	9	1,406	11	50	10	530	12	1,099	9	1,481
16	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	13	317	10	178	12	740	11	1,320	13	212	10	254

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN—*Concluded.*

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899, No fertilizers used since. Clover sown in 1900 in place of the corn and ploughed under in May, 1901, before the corn was planted. In 1903 clover was again sown and ploughed under in May, 1904.	Average Yield for Fourteen Years. ½ Plot No. 1—weight of green fodder. Per acre. Tons.	lbs.	½ Plot No. 2—weight of green fodder. Per acre. Tons	lbs	15th Season, 1904. ½ Plot No. 1—Selected Leaming, weight of green fodder. Per acre. Tons.	lbs.	½ Plot No. 2—Angel of Midnight, weight of green fodder. Per acre. Tons	lbs	Average Yield for Fifteen Years. ½ Plot No. 1—weight of green fodder. Per acre. Tons.	lbs.	½ Plot No. 2—weight of green fodder. Per acre. Tons	lbs
17	Mineral superphosphate, No. 1, 600 lbs.; muriate of potash 200 lbs.; sulphate of ammonia, 150 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..	13	1,069	9	1,927	14	270	12	1,610	13	1,149	10	306
18	Muriate of potash, 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..	9	1,836	7	211	13	120	12	1,440	10	255	7	960
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and '90; (muriate of potash 200 lbs., substituted, each year since); dried blood, 300 lbs.; mineral superphosphate, No. 1. 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..	12	569	8	1,689	13	1,510	13	810	12	765	9	297
20	Wood ashes, unleached, 1.900 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.	10	1,739	8	356	14	1,510	13	1,800	11	257	8	1,119
21	Bone, finely ground, 500 lbs.; sulphate of ammonia, 200 lbs.; muriate of potash, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then............	12	1,347	7	1,207	12	1,950	12	70	12	1,387	7	1,797

PLOTS OF MANGELS AND TURNIPS.

In conducting these experiments, the roots only have been taken from the land, the tops have always been cut off and left on the ground to be ploughed under, so that the plant food they have taken from the soil may be returned to it. One-half of each one-tenth acre plot in the series has been devoted to the growth of mangels, and the other half to turnips, and these crops have been alternated from year to year. The preparation of the land has been the same for both these roots. Until 1900 it was ploughed in the autumn after the crop was gathered, gang-ploughed deeply in the spring after the barn-yard manure had been spread on plots 1, 2 and 6, and after gang-ploughing, the other fertilizers were spread by scattering them evenly over the surface, after which it was all harrowed with the smoothing harrow, then made in ridges 2 feet apart, rolled and sown.

In 1889, the variety of mangel used was the Mammoth Long Red. In 1890, three varieties were sown on each plot. In 1891, each plot again had three varieties, and from 1892 to 1902 one variety only was used, namely, the Mammoth Long Red. About 4 pounds of seed were sown per acre each year.

Two varieties of turnips were sown on the half plots devoted to these roots in 1889, and in 1890, a single variety, Carter's Elephant Swede. In 1891, six varieties were sown. In 1892, the Improved Purple Top Swede only was sown, in 1893 and 1894, the Prize Purple Top Swede, in 1895, the Imperial Swede, and from 1896 to 1902, the Prize Purple Top Swede. The land used for the turnips, which are usually sown later than the mangels, was prepared in the same manner as for the mangels. It was then allowed to stand until the day before sowing, when it was gang-ploughed shallow or cultivated to kill weeds and loosen the soil, ridged, rolled and sown. About 3 pounds of seed were sown per acre.

In 1900 and 1903, no crops of mangels and turnips were grown, but clover was sown in their place in May in the proportion of 12 pounds per acre. This made a strong growth and was cut twice each year during the season, and left on the ground to decay, so that when ploughed under, the land might get the full benefit of the clover crop. The clover was allowed to remain growing until near the middle of May, by which time it had made a very heavy growth. It was then ploughed under about 6 inches deep and harrowed well, then made up into ridges 2 feet apart. These were rolled with a hand roller, which flattened the ridges considerably and made a firm, even seed bed. The crops of clover and roots are alternated in this way, for the purpose of supplying humus and also of gaining information as to the fertilizing effect of green clover ploughed under on land to be used for growing roots.

In 1904, the mangels were sown on May 12, and pulled on October 14; the turnips were sown May 12, and pulled October 14. The yield per acre has been calculated in each case from the weight of roots gathered from two rows, each 66 feet long.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF MANGELS AND TURNIPS.

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1900 in place of the roots and ploughed under in May, 1901, before the roots were sown. In 1903 clover was again sown and ploughed under in May, 1904.	Average Yield for Thirteen Years.				14th Season, 1904. Varieties.				Average Yield for Fourteen Years.			
		Mangels, Weight of Roots.		Turnips, Weight of Roots.		West Half Plot. Mangels, Mammoth Long Red: Weight of Roots.		East Half Plot. Turnips, Purple Top Swede: Weight of Roots.		Mangels, Weight of Roots.		Turnips, Weight of Roots.	
		Per Acre.		Per Acre.		Per Acre.		Per Acre.		Per Acre.		Per Acre.	
		Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 20 tons per acre each year from 1889 to 1898 inclusive. No manure has been applied since then..........	22	1,267	15	1,327	12	1,830	23	1,400	21	1,879	16	475
2	Barn-yard manure (mixed horse and cow manure) fresh, 20 tons per acre each year from 1889 to 1898 inclusive. No manure has been applied since then....	21	792	15	1,522	12	1,200	23	200	20	1,535	16	570
3	Unmanured from the beginning.....	9	122	7	864	8	1,230	13	140	9	58	7	1,669
4	Mineral phosphate, untreated, finely ground, 1,000 lbs. per acre, used each year from 1889 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizers have been applied since then................	8	1,577	7	1,908	9	1,840	17	1,490	8	1,739	8	1,307
5	Mineral phosphate, untreated, finely ground, 1,000 lbs., nitrate of soda, 250 lbs. wood ashes, unleached, 1,000 lbs. per acre, used each year from 1889 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.	14	1,403	9	1,948	11	1,250	18	70	14	963	10	1,099
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 1,000 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1889 to 1897 inclusive. In 1898 1,000 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then..	18	53	12	1,949	12	1,760	18	1,230	17	1,318	13	755
7	Mineral phosphate, untreated, finely ground, 1,000 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890 (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years); nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1897 inclusive. In 1898 and 1899 1,000 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then	11	1,252	9	1,030	10	1,950	14	340	11	1,162	9	1,695
8	Mineral superphosphate, No. 1, 500 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890 (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years); nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then	14	159	11	1,618	10	1,590	14	820	13	1,690	11	1,990

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF MANGELS AND TURNIPS—*Concluded*.

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1900 in place of the roots and ploughed under in May, 1901, before the roots were sown. In 1903 clover was again sown and ploughed under in May, 1904.	Average Yield for Thirteen Years. Mangels, Weight of Roots. Per Acre. Tons.	lbs.	Average Yield for Thirteen Years. Turnips, Weight of Roots. Per Acre. Tons.	lbs.	14th Season, 1904, Varieties. West Half Plot. Mangels, Mammoth Long Red: Weight of Roots. Per Acre. Tons.	lbs.	14th Season, 1904, Varieties. East Half Plot. Turnips, PurpleTop Swede: Weight of Roots. Per Acre. Tons.	lbs.	Average Yield for Fourteen Years. Mangels, Weight of Roots. Per Acre. Tons.	lbs.	Average Yield for Fourteen Years. Turnips, Weight of Roots. Per Acre. Tons.	lbs.
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..	9	1,306	9	339	10	1,240	18	1,410	9	1,444	9	1,701
10	Nitrate of soda, 300 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizers have been applied since then................	14	823	9	918	10	1,420	14	990	14	294	9	1,637
11	Sulphate of ammonia, 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.	12	743	10	1,795	10	1,750	13	880	12	529	11	158
12	Unmanured from the beginning.....	7	894	7	645	7	1,910	12	1,320	7	966	7	1,407
13	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.....	12	842	8	1,891	9	50	14	220	12	356	9	628
14	Wood ashes, unleached, 2,000 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..........	11	76	8	317	12	740	16	1,200	11	266	8	1,523
15	Common salt (Sodium chloride), 400 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..	9	1,422	7	825	12	910	16	530	9	1,814	8	896
16	Mineral superphosphate, No. 1, 500 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.........	13	160	10	1,896	10	1,140	17	1,070	12	1,801	11	837
17	Mineral superphosphate, No. 1, 350 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..	13	1,179	10	694	10	970	21	1,200	13	735	11	301
18	Mineral superphosphate, No. 1, 500 lbs.; muriate of potash, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..........	12	1,988	11	285	11	820	19	810	12	1,762	11	1,465
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and 1890 (muriate of potash, 200 lbs., substituted each year since); dried blood, 250 lbs.; mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.........	14	820	12	503	11	1,750	18	990	14	458	12	1,395
20	Wood ashes, unleached, 1,500 lbs.; common salt (Sodium chloride), 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..	15	324	10	1,562	12	690	20	30	14	1,922	11	881
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..	15	48	11	309	12	1,530	19	1,610	14	1,725	11	1,544

The results had in 1904 in crops from the plots under these experiments show still further the benefits arising from the ploughing under of clover.

EFFECTS OF FERTILIZERS ON OATS, CLOVER AND BROME GRASS.

In continuation of the report made last year on the 'Effects of Fertilizers on Wheat, Oats, Clover and Brome Grass,' the following tables are submitted. A part of the wheat plots were unfortunately so injured as to make the comparisons in that series of no value, hence no reference is made to the wheat plots. Fertilizers were applied in the proportions stated to the different series of plots in 1900, 1902 and 1904.

RESULTS OF THE APPLICATION OF FERTILIZERS TO OATS.

Sown, May 9; Ripe, August 10, 1904.

No. of Plot.	Table I. Name of variety, Improved Ligowo.	Yield of Grain per Acre.		Yield of Straw per Acre.
		Bush.	Lbs.	Lbs.
1	Superphosphate, 400 lbs. per acre	70	20	3,160
2	Thomas' phosphate, 400 lbs. per acre	70	20	4,240
3	Thomas' phosphate, 800 lbs. per acre	82	12	2,920
4	Check	56	16	2,480
5	Thomas' phosphate, 400 lbs., kainit, 200 lbs. per acre	52	32	1,960
6	Superphosphate, 400 lbs., kainit, 200 lbs. per acre	51	26	3,200
7	Check	60	—	1,960
8	Thomas' phosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 160 lbs. p. acre	81	26	4,180
9	Superphosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	83	18	4,360
10	Barnyard manure, mixed horse and cow, fresh, 12 tons per acre	61	6	3,960
11	Barnyard manure, mixed horse and cow, well rotted, 12 tons per acre	80	—	4,320
12	Check	76	16	4,040
13	Fresh slacked lime, 1,000 lbs. per acre	71	26	4,600
14	Nitrate soda, 100 lbs. per acre	80	—	5,120
15	Check	62	12	3,920
16	Nitrate soda, 200 lbs. per acre	70	20	5,600

RESULTS OF THE APPLICATION OF FERTILIZERS TO CLOVER.

First cutting, June 23; second, August 29, 1904.

No. of Plot.	Table II. Fertilizers used.	Yield per Acre.							
		1st Cutting.				2nd Cutting.			
		Green.		Cured.		Green.		Cured.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Superphosphate, 400 lbs. per acre	8	1,200	2	600	3	480	1	1,120
2	Thomas' phosphate, 400 lbs. per acre	9	920	3	80	3	—	1	1,200
3	Thomas' phosphate, 800 lbs. per acre	7	1,640	2	360	2	1,680	1	960
4	Check	7	80	2	260	3	360	1	1,220
5	Thomas' phosphate, 400 lbs., kainit, 200 lbs. per acre	8	1,040	2	960	3	1,680	1	1,600
6	Superphosphate, 400 lbs., kainit, 200 lbs. per acre	9	840	2	1,280	2	1,360	1	920
7	Check	8	1,440	2	800	2	1,280	1	880
8	Thomas' phosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	8	1,320	2	720	2	1,200	1	400
9	Superphosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	8	1,560	1	1,920	2	480	1	120
10	Barnyard manure, mixed horse and cow, fresh, 12 tons per acre	6	160	1	1,120	3	880	1	720
11	Barnyard manure, mixed horse and cow, well rotted, 12 tons per acre	7	120	1	1,960	2	1,280	1	400
12	Check	7	920	1	1,520	3	720	1	920
13	Fresh slacked lime, 1,000 lbs. per acre	6	400	1	1,360	2	400	1	—
14	Nitrate soda, 100 lbs. per acre	6	720	1	1,760	2	800	1	—
15	Check	5	1,240	1	1,080	3	400	1	1,520
16	Nitrate soda, 200 lbs. per acre	7	480	1	1,560	4	400	1	1,040

RESULTS OF THE APPLICATION OF FERTILIZERS TO AWNLESS BROME GRASS.

Crop Cut June 27, 1904.

No. of Plot.	Table III. Fertilizers used.	Height of Brome Grass	Yield per Acre. Green.		Cured.	
		Inches.	Tons.	Lbs.	Tons.	Lbs
1	Superphosphate, 400 lbs. per acre	44—48	9	320	4	1,040
2	Thomas' phosphate, 400 lbs. per acre	44—48	7	480	4	—
3	Thomas' phosphate, 800 lbs. per acre	44—48	7	1,400	3	—
4	Check	44—48	5	800	2	440
5	Thomas' phosphate, 400 lbs.; kainit, 200 lbs. per acre	45—50	5	1,600	2	800
6	Superphosphate, 400 lbs.; kainit, 200 lbs. per acre	45—50	7	—	2	1,800
7	Check	44—48	5	1,760	2	1,480
8	Thomas' phosphate, 400 lbs.; kainit, 200 lbs.; nitrate soda, 100 lbs. per acre	45—50	4	240	2	1,800
9	Superphosphate, 400 lbs.; kainit, 200 lbs.; nitrate soda, 100 lbs. per acre	45—50	9	80	3	1,920
10	Barn-yard manure, mixed horse and cow, fresh, 12 tons per acre	45—50	7	560	3	560
11	Barn-yard manure, mixed horse and cow, well rotted, 12 tons per acre	45—50	6	—	2	840
12	Check	44—48	5	880	2	560
13	Fresh slacked lime, 1,000 lbs. per acre	44—48	3	1,800	1	1,760
14	Nitrate soda, 100 lbs. per acre	45—50	7	40	3	240
15	Check	45—50	8	160	3	1,040
16	Nitrate soda, 200 lbs. per acre	45—50	7	640	3	320

INCREASED CROPS FROM THE PLOUGHING UNDER OF CLOVER.

Further experiments have been conducted during 1904 to show the benefit arising from the ploughing under of clover to add humus and fertility to the soil. In all these experiments there has been a marked increase in the crop the first year following the ploughing under of clover, a considerable increase the second year, and some increase on the third year after clover.

Plot.	Group 1.	1904. Banner Oats. Yield of Grain. Per acre.		Yield of Straw. Per acre.	Corn Selected Leaming. Yield per acre.		Potatoes. Everett. Yield per acre.	
		Bush.	Lbs.	Lbs.	Tons.	Lbs.	Bush.	Lbs
1	Crop in 1904 after clover in 1903	68	8	4,080	29	1,600	402	—
2	Crop in 1904 on plot where no clover was grown in 1903	43	18	2,080	26	400	362	20
	Gain from use of clover	24	24	2,000	3	1,200	39	40

Group 2.

In each of the divisions of this group there were also three plots. In the upper three in each table, the crops were sown after clover, grown in 1901, and ploughed under in the autumn of that year; the lower three show the crops where no clover was grown. In divisions 3, 6 and 9 the effect is also shown, on the crops of 1903 and 1904, of allowing the clover sown in 1901 to grow for two seasons and ploughing it under in the autumn of 1902.

Division 1.	1902. Banner Oats. Yield of Oats. — Per acre.		1902. Banner Oats. Weight of Straw. — Per acre.	1903. Turnips. Yield per acre.		1904. Potatoes. Yield per acre.	
	Bush.	Lbs.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1 Crops in 1902-3-4, after clover in 1901	72	20	4,720	25	—	390	—
2 Crops in 1902-3-4, on plot where no clover was grown in 1901	58	28	3,120	20	1,920	376	20
Gain from use of clover................	13	26	1,600	4	80	13	40

Division 2.	1902. Potatoes, Everett. Yield Per Acre.		1903. Carrots. Yield Per Acre.		1904. Potatoes, Everett. Yield Per Acre.	
	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
3 Crops in 1902-3-4, after clover in 1901..........	392	40	20	1,400	378	40
4 Crops in 1902-3-4, on plot where no clover was grown in 1901...	358	—	18	280	346	20
Gain from use of clover	34	40	2	1,120	32	20

Division 3.	1902. Corn Selected Leaming. Yield Per Acre.		1903. Potatoes, Everett. Yield Per Acre.		1904. Mensury Barley. Yield of Barley. — Per Acre.		1904. Mensury Barley. Weight of Straw. — Per Acre.
	Tons.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Lbs.
5 Crops in 1902-3-4, after clover in 1901............	20	800	202	—	45	—	3,840
6 Crops in 1902-3-4, on plot where no clover was grown in 1901	15	—	154	40	38	16	3,750
Gain from the use of clover...........	5	800	47	20	6	32	90
7 Crops in 1903-4, on plot where clover was allowed to grow two seasons..................	....	......	200	40	35	—	3,720
8 Crops in 1903-4, on plot where no clover was grown in 1901..........................	......	.....	134	40	32	24	2,210
Gain from the use of clover.....	......	.....	66	00	2	24	1,510

GROUP 2—*Continued.*

Division 4.	1902. Banner Oats. Yield of Oats.—Per Acre.		1902. Banner Oats. Weight of Straw.—Per Acre.	1903. Mangels. Yield Per Acre.		1904. Turnips. Yield Per Acre.	
	Bush.	Lbs.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
9 Crops in 1902-3-4, after clover in 1901	70	20	4,960	30	1,000	24	40
10 Crops in 1902-3-4, on plot where no clover was grown in 1901	61	6	2,720	27	320	19	1,160
Gain from the use of clover	9	14	2,240	3	680	4	880

Division 5.	1902. Potatoes, Everett. Yield Per Acre.		1903. Sugar Beets. Yield Per Acre.		1904. Turnips. Yield Per Acre.	
	Bush.	Lbs.	Tons.	Lbs.	Tons.	Lbs
11 Crops in 1902-3-4, after clover in 1901	386	20	20	680	27	360
12 Crops in 1902-3-4, on plot where no clover was grown in 1901	346	40	16	1,040	25	640
Gain from use of clover	39	40	3	1,640	1	1,720

Division 6.	1902. Corn Selected Leaming. Yield Per Acre.		1903. Corn Selected Leaming. Yield Per Acre.		1904. Banner Oats. Yield of Oats.—Per Acre.		1904. Banner Oats. Weight of Straw.—Per Acre.
	Tons.	Lbs.	Tons.	Lbs.	Bush.	Lbs.	Lbs.
13 Crops in 1902-3-4, after clover in 1901	23	1,200	18	1,440	61	6	3,600
14 Crops in 1902-3-4, on plot where no clover was grown in 1901	17	720	14	1,200	54	4	2,880
Gain from use of clover	6	480	4	220	7	2	720
15 Crops in 1903-4, on plot where clover was allowed to grow two seasons	....	......	15	1,600	56	16	2,680
16 Crops in 1903-4, on plot where no clover was sown in 1901	....	......	7	......	45	30	2,440
Gain from use of clover	....	......	8	1,600	10	20	240

Division 7.	1902. Banner Oats. Yield of Oats.—Per Acre.		1902. Banner Oats. Weight of Straw.—Per Acre.	1903. Preston Wheat. Yield of Wheat.—Per Acre.		1903. Preston Wheat. Weight of Straw.—Per Acre.	1904. Mangels. Yield Per Acre.	
	Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.	Tons.	Lbs.
17 Crops in 1902-3-4, after clover in 1901	72	32	5,280	16	..	1,760	21	1,080
18 Crops in 1902-3-4, on plots where no clover was grown in 1901	63	18	3,280	14	40	1,400	21	80
Gain from the use of clover	9	14	2,000	1	20	360	..	1,000

GROUP 2.—*Concluded.*

Division 8.	1902. Potatoes, Everett. Yield Per Acre.		1903. Mensury Barley. Yield of Barley. — Per Acre.		1903. Mensury Barley. Weight of Straw. — Per Acre.	1904. Mangels. Yield Per Acre.	
	Bush.	Lbs.	Bush.	Lbs.	Lbs.	Tons.	Lbs.
19 Crops in 1902-3-4, after clover in 1901	396	..	51	32	2,640	26	1,520
20 Crops in 1902-3-4, on plot where no clover was grown in 1901	353	20	50	.....	2,520	26	440
Gain from the use of clover	42	40	1	32	120	..	1,080

Division 9.	1902. Corn, Selected Leaming. Yield Per Acre.		1903. Banner Oats. Yield of Oats. — Per Acre.		1903. Banner Oats. Weight of Straw. — Per Acre.	1904. Corn, Selected Leaming. Yield Per Acre.	
	Tons.	Lbs.	Bush.	Lbs.	Lbs.	Tons.	Lbs.
21 Crops in 1902-3-4, after clover in 1901	22	1,600	82	12	3,920	24	1,200
22 Crops in 1902-3-4, on plot where no clover was grown in 1901	16	800	76	16	3,240	22	..
Gain from the use of clover	6	800	5	30	680	2	1,200
23 Crops in 1903-4, on plot where clover was allowed to grow two seasons	....		87	2	4,880	25	800
24 Crops in 1903-4, on plot where no clover was grown in 1901	....		74	4	4,080	24	1,200
Gain from the use of clover	....		12	32	800	..	1,600

INFLUENCE of Previous Crops on Yield of Grain and Weight of Straw of Banner Oats, grown in 1904.

Banner Oats.	1904. Banner Oats. Yield of Oats. — Per Acre.		1904. Banner Oats. Weight of Straw. — Per Acre.
	Bush.	Lbs.	Lbs.
1 Crop in 1904, after horse beans, rows 21 inches apart in 1903	61	6	3,280
2 Crop in 1904, after horse beans, rows 28 inches apart in 1903	80	..	4,720
3 Crop in 1904, after pease, crop harvested in 1903	83	18	5,160
4 Crop in 1904, on plot where crop of oats was harvested in 1903	84	24	5,280
5 Crop in 1904, after pease, crop ploughed under twice in 1903	88	8	6,280
6 Crop in 1904, after soja beans, rows 21 inches apart in 1903	52	32	2,400
7 Crop in 1904, after soja beans, rows 28 inches apart in 1903	72	32	3,600
8 Crop in 1904, after crop of sand vetch harvested in 1903	78	28	5,080
9 Crop in 1904, on plot where crop of oats was harvested in 1903	83	18	5,200
10 Crop in 1904, after sand vetch ploughed under twice in 1903	89	14	5,480
11 Crop in 1904, after alsike clover in 1903	45	10	2,140
12 Crop in 1904, on plot where no clover was grown in 1903	28	8	1,120
13 Crop in 1904, after buckwheat crop harvested in 1903	30	20	1,640
14 Crop in 1904, on plot where crop of oats was harvested in 1903	71	26	3,640
15 Crop in 1904, after buckwheat, ploughed under twice in 1903	67	2	4,120
16 Crop in 1904, after Alfafa clover in 1903	44	24	2,440
17 Crop in 1904 on plot where no clover was grown in 1903	35	10	1,680
18 Crop in 1904, after flax in 1903	27	2	1,440
19 Crop in 1904, on plot where no flax was grown in 1903	49	14	2,160
20 Crop in 1904, after hairy vetch in 1903	70	20	3,840

BULLETINS ISSUED DURING 1904.

Four bulletins have been issued during the year.

No. 44, on the 'Results obtained in 1903 from trial plots of grain, fodder, corn, field roots and potatoes,' issued jointly by the Director and the Experimentalist. In this bulletin there are presented the results of a large number of experiments which were conducted at all the experimental farms during the season of 1903, with oats, barley, spring wheat, pease, Indian corn, turnips, mangels, carrots, sugar beets and potatoes, in plots of uniform size and the crops grown under uniform conditions. Both earliness and productiveness are recorded. The average results are also given of the tests for a series of years of those varieties which have proved most profitable.

No. 45, on Emmer and Spelt, prepared by Dr. C. E. Saunders, Experimentalist, in which are given a number of descriptions of varieties of these two sorts of grain; the results are also submitted of many experiments which have been conducted with these cereals at the experimental farms.

Much interest has been awakened of late among farmers in some parts of this country in the growing of emmer and spelt, and in the bulletin referred to many facts are brought together, regarding the proportion of hull to kernel and the relative usefulness and cropping power of emmer and spelt in comparison with other cereals. There are also given in this bulletin the results of some analyses made by the Chemical Division of the kernels and hulls of emmer and spelt, showing the relative nutritive value of these cereals.

No. 46, on 'Alfalfa or Lucern, its culture, use and value.' This bulletin consists of three parts: Part 1 was prepared by Mr. J. H. Grisdale, Agriculturist of the Central Experimental Farm; Part 2, by Mr. Frank T. Shutt, Chemist of the Experimental Farms, and Part 3 by Dr. James Fletcher, Entomologist and Botanist of the Experimental Farms.

In reference to this plant, the economy of growing it for the feeding of stock and for ploughing under to enrich the soil, its deep rooting habit which gives it the power of drawing moisture and plant food from depths not reached by other plants, and the large quantities of palatable and nutritious fodder which it produces, are all discussed in this bulletin, also its adaptability to many of the climatic conditions found in the Dominion.

No. 47, 'Trees and Shrubs tested in Manitoba and the North-west Territories,' prepared by the Director. In this bulletin are given the results of a very large number of trials of trees and shrubs which have been planted at the Experimental Farms at Brandon, Manitoba, and at Indian Head, in the North-west Territories, during the past sixteen years to ascertain what species and varieties are hardy enough to endure the winter in those parts of the Dominion. In this bulletin is presented in a convenient and condensed form all the facts ascertained for the instruction and encouragement of those who desire to adorn their homes with these objects of beauty. The love of trees and shrubs is almost universal and nowhere is it more strongly felt than on the North-west plains where trees and shrubs are scarce. Hitherto considerable sums of money have been spent annually by settlers in the purchase of trees and shrubs from the east, most of which have been too tender to endure the climate. The information given in this bulletin will, it is hoped, greatly lessen this injudicious expenditure. This bulletin will also be useful to residents of eastern Canada, since any of the species found hardy enough to endure the climate of the North-west, may be planted with assurance of success in any of the eastern parts of this country.

VISITS TO THE BRANCH EXPERIMENTAL FARMS.

THE EXPERIMENTAL FARM AT BRANDON, MAN.

On August 5, I left Ottawa for the annual tour of inspection of the branch experimental farms and arrived in Brandon on August 7. Several days were spent on this farm at that time and two days more on the return journey, September 15-16. The crops on the higher lands on the farm were in good condition, but a heavy flooding of the Assiniboine river had seriously injured those on the lower lands. Rust prevailed on some of the plots of cereals to a limited degree, nevertheless many of the crops were very heavy.

In the uniform trial plots, the best varieties of spring wheat gave from 30 to 36 bushels per acre, six-rowed barley, 54 to 66 bushels, and two-rowed from 55 to 63 bushels per acre. Oats gave extraordinary returns, ranging from 112 to 134 bushels per acre, pease also gave extra heavy crops, from 60 to 85 bushels per acre. Roots also did well, and potatoes gave an immense crop, from 500 to 650 bushels per acre.

The fields gave evidence of good and careful cultivation. The stock, implements and buildings were also found in good condition.

The orchards of cross-bred apples and seedling crabs have made strong growth and some new and promising varieties were fruiting for the first time.

The pasture fields looked well, and the crop of hay was very fair. The forest and ornamental trees, also the shrubs and flowers had made good growth and presented an attractive appearance.

THE EXPERIMENTAL FARM AT INDIAN HEAD, N.W.T.

This farm was visited on August 10-12 and September 13-14. The wheat was an excellent crop. The best sorts on the trial plots gave from 45 to 50 bushels per acre, while the larger fields averaged about 40 bushels, the grain weighing from 61 to 63 lbs. per bushel. The wheat crop throughout this district was good and in many instances from 35 to 40 bushels per acre was harvested. The experiments carried on at Indian Head with early ripening varieties of grain command much attention from farmers. The Preston, Stanley and Huron, cross-bred sorts produced at the Central Experimental Farm were ripe and cut this year about a week before the Red Fife was ready to harvest.

The crop of oats was very heavy, ranging from 90 to 120 bushels per acre, while the best yielding sorts of barley gave from 60 to 67 bushels. There was very little rust on any of the cereals in the North-west. Pease yielded unusually well, from 60 to 68 bushels per acre, and the most prolific sorts of potatoes from 350 to 435 bushels.

Bromus inermis.—Brome grass is now a well established and important crop, and with the western rye grass *Agropyrum tenerum* furnishes the greater part of the hay fed to horses and cattle on the Experimental Farm. Indian corn has been successfully grown, giving from 10 to 20 tons of green fodder per acre. Field roots have also done well, excepting carrots, the crop of which has been light.

Many of the Siberian crabs and cross-bred apples fruited well; trees and shrubs also, planted for shelter and ornament, made luxuriant growth, while annual and perennial flowers provided a wealth of bloom.

Stock of all sorts looked well, giving evidence of attention and care. The buildings were in good condition and the implements well cared for.

THE EXPERIMENTAL FARM AT AGASSIZ, B.C.

The farm at Agassiz was visited from August 25 to 30. Both fruit and forest trees were found to be suffering from the drought which had prevailed for some weeks

previous. The leaves were turning yellow. Extensive fires were consuming the forests in many districts and much valuable timber was destroyed. The air in many localities was so filled with smoke as to veil the beauties of the landscape.

The hay crop had been an excellent one and the clover exceptionally heavy. The yield of grain also was fairly good. Oats have given as high as 67 bushels per acre, barley 63 bushels, and spring wheat 33 bushels per acre. Indian corn had made good growth but was rather uneven, due chiefly to faulty germination of the seed. Roots and potatoes promised well.

The fruit orchards were not in a very satisfactory condition. Many of the young apple trees have been greatly injured by canker which has spread rapidly and proved very destructive, making it necessary to root up many of the trees. Pears were a very light crop and some of the trees were withering from the drought. Plums were a fair crop and the rot was not very prevalent this season, so that most of the fruit was gathered in good condition.

Blackberries were fruiting well and raspberries had given a fair crop. Currants and gooseberries had also borne fairly well. The nut trees and mulberries were well laden with fruit.

The cattle and sheep were in good condition, and notwithstanding the long period of dry weather the pastures were looking fairly well. Pigs were thriving, but the litters had been smaller than usual. The fowls had made good progress and there was a large number of chickens.

VISIT TO VICTORIA.

While in Victoria, several orchards were seen and the crops seemed to be fully up to the average. One of these, owned by Mr. R. M. Pamler, deserves special notice. In has been established as a commercial orchard and comprises twenty acres in all. The trees have all been planted about eighteen feet apart with the intention of allowing them to bear until they begin to crowd each other and then gradually thin them out. In this orchard there are planted about 3,000 trees. The apples number about 2,000 and consist chiefly of Wealthy, Blenheim Orange, Duchess, Boskoop, Cox's Orange Pippin and Lord Suffield. Of pears there are about 200, chiefly Bartlett, Louise Bonne and Beurre Bosc. The cherries, of which there are about 800, are largely Olivet, Belle Magnifique and English Morello.

This method of growing fruit on the Island is said to have been very satisfactory and to have given good returns.

VISIT TO VERNON AND PENTICTON.

While at Vernon a visit was paid to the Coldstream ranch where the large orchards planted by Lord Aberdeen are now bearing abundantly. These orchards are in splendid condition and remarkably clean and well cultivated. The trees are thrifty with well formed heads, and the fruit is regularly thinned, so that none of the trees are allowed to overbear. Nearly all the fruit produced is of first quality.

The journey on Lake Okanagan from Okanagan Landing to Penticton was very enjoyable, and at the various landing places there was evidence of much progress, and settlement is going on rapidly. Kelowna, which is about half way down the lake, has now become a town of good size, and in the surrounding country, orchards can be seen in every direction. On the return journey, the steamer took on shipments of fruit, &c., for the east. At Summerland, 700 boxes of tomatoes, apples and plums were received, and at Peachland and Kelowna additional shipments were made. There is a rapidly growing business in fruits and vegetables throughout this region.

THE EXPERIMENTAL FARM AT NAPPAN, N.S.

The annual visit was paid to this farm in October, when all the crops were found to be harvested, excepting field roots. Owing to the unusually dry weather in

the summer all the grain and fodder crops were light. Hay was 20 to 25 per cent below the average, while oats, wheat and barley had also given considerably less than an average yield ; the quality of the grain, however, was good. Indian corn was not a heavy crop and had been cut by a severe frost which had lessened its weight. The crop of turnips was heavy, giving from 30 to 40 tons per acre.

The stock was in good condition, the steers under feeding tests were making satisfactory progress and the dairy cows milking fairly well.

The apple orchards have made good progress, and a large proportion of the trees have borne good crops. Pear trees have given very little fruit during 1904, some of the varieties look very healthy, while others have made but a short and feeble growth. Similar variation was noticeable among the plums and some of the European sorts had fruited fairly well, but the American plums seem to be of little value here.

Of cherries the Bigarreau varieties in the older and more exposed orchard have suffered much from winter killing of the wood, whereas in the younger orchard in the shelter of the woods they have mostly escaped injury. Many of the Morello's and Russian sorts have made good growth, but have had very little fruit this year, probably because of the killing of the blossom buds during the severe winter of 1903-04. Some seedlings of the Kentish cherry, which is found in many parts of Nova Scotia, have been planted and are making promising growth. A large proportion of the cherries raised by the farmers of Nova Scotia are from seedling trees of this character, which are very generally distributed, are very hardy and usually bear good crops.

ACKNOWLEDGMENTS.

Grateful acknowledgments are due to those who have rendered me special service during the year. To the Director of the Arnold Arboretum, Jamaica Plains, Mass., for seeds of many different sorts of trees and shrubs, also for a fine collection of specimens of Crataegus and other rare trees for the Arboretum at Ottawa. To the United States Department of Agriculture, for many favours, including samples of cereals, seeds of fodder crops, &c., for test from foreign countries. To the Director of the Royal Gardens, Kew, England, for seeds of many sorts of trees, shrubs and plants. To Prof. John Macoun and Mr. J. M. Macoun, both of the Geological and Natural History Survey of Canada, for seeds of rare Canadian plants.

To the officers of the Central and Branch Experimental Farms my thanks are due for their earnest co-operation in carrying on the different divisions of the work. Grateful acknowledgments are also due to those members of the staff who have aided me in those branches of which I have had personal charge. To Mr. John Fixter, the farm foreman, who has taken charge of the special tests made with fertilizers on farm crops and aided me with practical suggestions. To Mr. George Fixter, to whom I am indebted for his careful supervision of the distribution of samples of seed grain. To Miss M. Hager, for valuable help in the taking of field notes and in the compilation of records in connection with work on the several experimental farms. To Mr. James Taggart, for the care and good judgment he has displayed as foreman of the ornamental grounds, and to Mr. Wm. T. Ellis, who has done careful work in testing the vitality of seeds, the management of the plants in the green-house and in propagating useful plants for out-side decoration. Mr. Ellis has also rendered useful service in the taking of meteorological records.

I also take pleasure in bearing testimony to the faithful services of my secretary, Mr. Malcolm C. O'Hanly. The employees also of all the farms have my thanks for the interest they have taken in their work, and the care with which they have discharged their respective duties.

WM. SAUNDERS,
Director of Experimental Farms.

REPORT OF THE AGRICULTURIST

(J. H. GRISDALE, B. AGR.)

DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith reports upon the horses, cattle, sheep, swine and farming operations under my supervision during the past year.

I have to report a fairly successful year in the different branches of my division and in this connection I wish to acknowledge my indebtedness for assistance and interested co-operation in their various positions of the farm foreman, Mr. John Fixter, of the herdsman, Mr. C. T. Brettell, and of the dairyman, Mr. J. Meilleur.

During the year I have attended a number of meetings in various parts of Canada, and have conducted a number of student judging contests, in addition to my regular work of supervising and directing the experimental feeding and farming operations at the Central Experimental Farm.

From December 1, 1903, to November 30, 1904, 2,067 letters were received and 2,967 despatched by the agricultural division.

I have the honour to be, sir,
Your obedient servant,
J. H. GRISDALE,
Agriculturist.

LIVE STOCK.

The live stock now (December 1, 1904) occupying the different stables and pens under my charge include horses, cattle, sheep and swine.

HORSES.

The horses are kept for labour exclusively, although some experimental feeding is usually under way to gain some information as to the most economical methods of feeding draught horses, as well as experiments to determine the comparative values of different foods as forage for the same.

The horses are usually 19 in number, made up of:—

Thirteen heavy draught horses of Clydesdales and Percheron blood.

Five heavy driving horses.

One light driver.

CATTLE.

There are representatives of four breeds of cattle, viz.:—Shorthorn, Ayrshire, Guernsey and Canadian. There are besides, a number of grade cattle and steers. These cattle are kept for breeding and feeding operations, mostly of an experimental character. Pure bred breeding animals are usually on sale, however, and a considerable number are sold in the course of the year.

Pure Bred Breeding Cattle.

The pure bred cattle in the barns at present are as follows:—

Shorthorns, including 3 bulls and 13 females.

Ayrshires, including 2 bulls and 15 females.

Guernseys, including 4 bulls and 8 females.

Canadians, including 1 bull and 7 females.

Grade Cattle.

At present the grades number 17 head, made up of 3 Shorthorn grades, 5 Ayrshire grades, 7 Guernsey grades and 2 Canadian grades.

Steers.

Sixty-three steers are under feed at present. They are of different ages and breeding and the number is made up of:—

15 three-year-olds.
20 two-year-olds.
16 yearlings.
12 calves.

SHEEP.

Sheep are not kept in large numbers, only 43 being now in the pens. Two breeds are kept, namely : Shropshires and Leicesters.

There are 25 Shropshires, as follows :—1 aged ram, 3 spring ram lambs, 14 aged ewes and 7 ewe lambs.

The Leicesters number 13, made up as follows :—1 aged ram, 2 ram lambs, 7 aged ewes and 4 ewe lambs.

There are besides two grades and three wethers.

SWINE

One hundred swine of all classes are now in the pens being fed experimentally or being kept for breeding purposes. The breeds kept are Berkshires, Tamworths and Yorkshires.

The Yorkshires are 37 in number, including:

2 stock boars.
4 young boars.
10 breeding sows.
6 young sows.
15 sucklings.

The Berkshires are 7 in number, including :

1 stock boar.
4 breeding sows.
2 young sows.

The Tamworths are 5 in number, including:

3 breeding sows.
1 young sow.
1 young boar.

HORSES.

There are 19 horses in the stables. These horses are expected to do the work in the various departments during the year. The work on the '200 acre farm' is but a part of their duties. They work in addition for the horticultural and experimental departments, as well as upon the lawns and in the arboretum. In addition a large amount of hauling in connection with the different departments, as well as road making and messenger service, takes up much of their time.

HORSE LABOUR.

During the year from December 1, 1903, to November 30, 1904, the work done by the 19 horses kept in the stables here was equivalent to 5,260 days work, distributed as follows:—Live stock, hauling feed, marketing stock, &c., 109 3-10 days ; farm work (200 acre farm), 722 8-10 days ; draining and care of roads, including removing snow and breaking roads in winter, 92 days ; manure on 200 acre farm, 261 6-10 days ; cleaning land, gathering stones, &c., 84 5-10 days ; arboretum, 169 5-10 days ; horticultural division, 611 5-10 days ; lawns, &c., 160 5-10 days ; experimental division, 586 days ; bulletins and reports to and from farm office, 100 days ; poultry, 8 1-10 days ; mail, including milk delivery, 171 7-10 days ; omnibus service, including 3 horses for omnibus, 2 horses for general driving and 1 horse for supervision of work, 2,122 days; work about greenhouse, outbuildings, sidewalks, exhibitions, &c., 60 5-10 days.

In estimating the cost of farming operations further on in this report, $2.50 per day is charged for team and driver. To feed and care for the horses, cost 37 cents per

horse per working day, and the driver received $1.41\frac{2}{3}$ per day. It is evident therefore that the team and driver cost $2.16 per day, leaving a margin of 32 cents, or 16 cents per horse per day for wear and tear.

FEEDING HEAVY HORSES.

Several experiments in feeding heavy horses have been conducted during the year.

Not infrequently oats are high-priced when bran is cheap. During the past year chopped oats have usually sold for from $24 to $26 per ton on the Ottawa markets. Bran has been as low as $15 per ton.

To the man with many horses to feed, economy in the meal part of the ration is a most important consideration. For that reason one of the experiments was conducted for the purpose of finding out if bran could be used to any considerable extent as a substitute for oats.

The horses, 12 in number, were divided into 6 groups of 2 each ; the roughage ration in each case being oat hay.

Group 1 received a meal mixture of equal parts of oats and bran; group 2, 1 part bran to 2 parts oats; group 3, 2 parts bran to 1 part oats; group 4, pure oats; group 5 oil meal 1 part, oats 10 parts; and group 6, bran 2 parts, oil meal 1 part, and oats 10 parts. The oats were ground in every case, and the ground oats or other meal and ground oats were mixed with the cut hay and the whole mass dampened.

The meal was fed in three nearly equal portions morning, noon and night, while only about one-fifth of the hay was fed in the morning, as much at noon, and the balance or three-fifths at night.

To illustrate, one of the horses in group 1 received his rations as follows:—

Morning, hay, 3 lbs.; meal mixture, 6 lbs.

Noon, hay, 3 lbs.; meal mixture, 6 lbs.

Evening, hay, 8 lbs.; meal mixture, 5 lbs.

The meal mixture and cut oat hay being mixed together and slightly dampened in each case.

BRAN FEEDING EXPERIMENT—OAT HAY.

Group.	Average weight Sept. 25.	Meal Ration, kind.	Hay (all fed on oat hay).	Amt. Meal Mixture fed in 40 days to 1 horse.	Amt. Oat Hay fed in 40 days.	Daily Meal Ration.	Daily Hay Ration.	Average weight Nov. 4.	Loss — or Gain +	Value of Food consumed in 1 day.	Value of Food consumed in 40 days.	Cost of Food for 1 year if such a meal ration were fed.	Cost of Food for 1 year if pure oats were fed.	Saving in 1 year by feeding such grain ration rather than pure oats.
									Lbs.	Cts.	$ cts.	$ cts.	$ cts.	$ cts.
1	1,488	Bran... 1 Oats.... 1	Oat hay.	680	580	17	$14\frac{1}{2}$	1,495	7+	22	8 80	80 30	89 06	8 76
2	1,604	Bran... 1 Oats.... 2	" ..	800	760	20	19	1,601	3—	27·98	11 19	102 12	111 83	9 71
3	1,685	Bran... 2 Oats.... 1	" ..	800	700	20	$17\frac{1}{2}$	1,649	36—	24·77	8 91	90 41	109 94	19 53
4	1,669	Oats......	" ..	800	760	20	19	1,663	6—	30·65	12 26	111 87	111 87	
5	1,656	Oil meal 1 Oats....10	" ..	680	740	17	$18\frac{1}{2}$	1,622	34—	27·22	10 89	99 35	98 10	1.25 loss
6	1,673	Bran... 2 Oil meal 1 Oats....10	" ..	800	620	20	$15\frac{1}{2}$	1,624	49—	28·61	11 44	104 46	107 38	2 92

Group 1, on bran and oats equal parts, seemed to like their ration and did very well on it during the 40 days, making a gain of 7 lbs. each in that time. This is a meal mixture that may safely be fed by any owner of heavy horses, as they are practically certain to do well on it. It is much better adapted for feeding with timothy hay than is a ration of pure oats. Where bran was valued at $16 per ton and ground oats at $24, there would be a saving of $8.76 in the cost of feeding a horse for one year as compared with feeding pure oats.

Group 2, on bran 1 part and oats 2 parts, did very well on their ration and seemed to relish it.

Group 3, on bran 2 parts and oats 1 part, seemed fond of the meal mixture, but did not like the oat hay and consequently lost somewhat in weight. When timothy hay was substituted for the oat hay, however, this group came up in weight and did as well as any of the others. This mixture may be recommended as a good meal ration for working horses and is certainly very economical in comparison with pure oats, since there would be a saving of $19.53 in the year by feeding such a ration instead of an equal weight of pure oats.

Group 4, on pure oats did very well. Their ration, however, while not any heavier than that of several other groups cost 30·65 cents for the day or 2 cents more than the next most expensive.

Group 5, on oil meal 1 part, and oats 10 parts, seemed to enjoy their food but succeeded in losing 34 lbs. each in weight. Oil meal is usually found to give very good results and even in this case seemed to help keep the horses in good health and spirits. The price was against it, however, as it was found to have raised the cost of the ration slightly above what it would have been had pure oats been fed.

Group 6, on bran 2 parts, oil meal 1 part, and oats 10 parts, would be considered by most horsemen as being an ideal ration. They liked the meal very much but did not care for the oat hay. As soon as put on timothy hay they started to recover in weight very rapidly. Even though bran constituted such a small portion of the ration it more than overcame the extra cost of the oil meal and there was a slight saving over what would have been the cost had pure oats been fed, viz.: $2.92 in one year.

All the horses were on general farm work. Sometimes one team would for a few days be put at harder work than the others but things were fairly equal.

The oat hay had been cut a little on the ripe side and was not very palatable. A glance at the following table will show how the groups were affected by the change to timothy hay.

BRAN FEEDING EXPERIMENT—TIMOTHY HAY.

Group.	Average weight when starting oat hay, Sept. 25.	Average weight when finishing oat hay, Nov. 4.	Loss — or Gain + while on oat hay 40 days.	Average weight 10 days after being fed on timothy hay.	Average gain in 10 days after change from oat hay to timothy hay.	Meal Ration.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
1	1,488	1,495	7+	1,507	12	Bran 1, oats 1.
2	1,604	1,601	3—	1,628	27	Bran 1, oats 2.
3	1,685	1,649	36—	1,668	17	Bran 2, oats 1.
4	1,669	1,663	6—	1,674	11	Oats.
5	1,656	1,622	34—	1,633	11	Oil meal 1, oats 10.
6	1,673	1,624	49—	1,656	32	Bran 2, oil meal 1, oats 10.

FEEDING ROOTS AND ENSILAGE TO WORKING HORSES.

The effect of feeding roots or ensilage to working horses has been studied during the year and a few points noted.

The roots experimented with were turnips, mangels and carrots, in addition one lot received ensilage as a part of their ration. A check lot receiving no feed other than the regular ration of hay, oats and bran was under feed at the same time.

The following table shows the amount of each kind of succulent food fed and the results so far as the gains or losses in weight of the horses are concerned.

Group.	Average weight Nov. 19.	Kind of roots fed 1 horse.	Amount fed in 14 days.	Average daily feed of roots.	Meal Ration, amt. fed in 1 day.	Hay (mixed), amt. fed in 1 day.	Average weight of horses Dec. 3.	Loss – or Gain +
								Lbs.
1	1,490	Carrots.	152	10	17	13	1,460	30—
2	1,625	Mangels.	92	6	18	15	1,610	15—
3	1,657	Turnips.	152	10	18	15	1,657	
4	1,595	Ensilage.	152	10	18	15	1,590	5—
5	1,625	... .	....	....	18	15	1,642	17+

As a general conclusion it may be stated that when such amounts of roots, &c., as are indicated in the table are fed horses working every day, the effect is not likely to be very good. The roots, &c., are laxative in character, hence any heavy exercise when receiving such food induces an undue looseness which is both unpleasant and injurious. There seemed to be but little preference in this respect among the feeds mentioned, and the only horses not suffering from this affection during the period of the experiment were the ones getting no succulent food.

Turnips and carrots seemed the most palatable of the four, with ensilage almost as welcome to the horses and mangels not at all in favour.

It was observed that fed in smaller amounts per day or fed to idle horses no evil effects were noticeable. The roots or ensilage did not seem to replace any of the regular ration of meal and hay and the feeding of these feeds was an added expense rather than an economy.

Where fed to idle horses, however, or where fed to horses it was desired to put in better condition, a small amount of roots—5 to 8 pounds per day—has been found beneficial, as serving to prevent digestion troubles.

DAIRY CATTLE.

The herd of dairy cattle during the year 1904 consisted of 28 females all told. They were:—

Ayrshires	6
Guernseys	5
Canadians	4
Shorthorns	3
Shorthorn grades	2
Ayrshire grades	4
Guernsey grades	3
Canadian grades	1

FEEDING THE DAIRY CATTLE.

One important consideration in feeding dairy cows is to make the ration not only as effective as possible as a milk-producing ration, but to make it as cheap as possible, and at the same time productive of good results. From the farmer's standpoint the most expensive part of the ration is the grain or meal part thereof. Our experience goes to show that with the use of clover hay and succulent food there is not the same, nor nearly the same need of a large proportion of meal in the ration as there is when either the one or the other of these most valuable milk-producing foods is lacking. When both are absent the amount of meal necessary to insure good returns from the cattle is so great as to render the profitable production of milk almost impossible in winter.

Both clover hay and succulent food are produced in abundance on the farm here and every advantage is taken of these, to the dairy farmer, invaluable feeds, to reduce the cost of producing milk.

Accordingly, the roughage ration fed to the cows consisted of ensilage, roots, (mangels and sugar-mangels), clover hay and some chaff.

The amount of roughage fed varies considerably, since the milch cows vary in weight from 800 lbs. to 1,600 lbs. The approximate roughage ration fed per 1,000 lbs. live weight is 35 lbs. ensilage, 20 lbs. mangels, 3 lbs. clover hay and a little chaff.

The meal mixture or grain ration consisted of different mixtures at different times and for different cows. Cows in heavy milk should receive a meal ration very rich in milk-forming material.

In feeding meal, even more than in feeding roughage, to dairy cows there is every opportunity for the careless or ignorant feeder to waste much valuable feed by feeding in too large quantities, or by feeding the wrong kind of meal or grain.

SUMMER FEEDING.

The cows were pastured as usual during the greater part of the summer months. They occupied one field of the three year rotation marked 'E' on page 82, and referred to there, as being under pasture in 1904. This field was able to carry about fifty head of cattle for over a month and over thirty head for over two months. When the pasture began to get bare it was supplemented by soiling crops cut and fed in the stables. A somewhat heavier grain ration was fed this year than usual on account of the greater extent to which soiling was carried on. The meal ration in summer consisted of oats and bran about equal parts. It was fed in amounts varying with the milk yield of the cows being fed, save in the case of heifers with their first calves which usually received more than their records seemed to call for as it was desired to encourage them and to cultivate in them the habit of maintaining a heavy and uniform flow of milk during the whole lactation period.

COST OF FEEDING.

In estimating the cost of feeding, the following prices were charged for feed stuffs. being the average local market rates for the same during the season of 1904, save in the case of ensilage and roots, which are charged for at the rate usually affixed in experimental feeding in all parts of America.

Pasture (per month)	$ 1 00	per cow.
Bran	16 00	per ton.
Gluten meal and oil meal	25 00	"
Oats and barley	21 00	"
Clover hay	7 00	"
Chaff	4 00	"
Roots and ensilage	2 00	"

In estimating the value of the product. 20 cents per pound is allowed for the butter and 15 cents per hundred pounds for the skim-milk and buttermilk. The butter

is manufactured in the farm dairy and sells on the market at from 22 to 30 cents per pound, an average of about 24 cents per pound during the last year. This leaves about 4 cents per pound for cost of manufacture.

The following tables give in detail the particulars concerning each cow, herd statements for each of the pure-bred herds, and monthly statements for all the herds combined.

The monthly statements for the whole milking herd show the total yield of milk for each month, its butter-fat content, the amount of butter produced, the number of pounds of milk required for a pound of butter, and the average yield of milk per cow per diem. The highest average per cent of fat was recorded in October and the lowest in January.

DAIRY CATTLE REPORTS.

During the year 28 different cows were milked for shorter or longer periods, as indicated on the first page of my report on dairy cattle, whereas in the subjoined 'herd reports' only 20 animals are reported upon.

In almost any dairy herd of any size some cows will be found that for some reason have given milk during only a very small part of any given year. Where a large number of cows are being considered, one or two such cases introduced in estimating the average does not materially affect the same, but where the herds to be compared are small the consideration of one or two such cases in one herd and no such cases in another makes an unjust difference in favour of the latter herd. To overcome this difficulty as far as possible, the records of three of the best cows in each herd, and of cows that had been in milk for the greater part of the year, have been taken, and the averages estimated from these records; rather than from the records of all cows of that particular breed that happened to calve during the year.

Report 1 is a summary of the more important points in connection with the year's work with the dairy herd.

Report 2 contains the individual records of all cows that gave milk during the year.

Reports 3, 4, 5, 6, 7, 8 and 9 give the herd records of the several pure-bred and grade herds under test.

REPORT 1.

GENERAL SUMMARY.

—	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total.
No. of cows giving milk for month..	26	26	24	20	24	25	25	28	28	26	25	25	
Lbs. of milk in month...	11,640	11,363	8,148	7,919	13,394	17,233	19,614	22,400	21,242	18,653	15,467	14,251	181,321
Average for 1 day........	388	378·7	271·6	263·8	446·4	574·4	553·8	746·6	708	621·7	515·5	475	494·8
Daily average per cow....	14·92	14·56	11·31	13·19	18·60	22 97	22·15	26·66	25·28	23·91	20·62	19	18·59
Per cent fat..	4·67	4·84	4·79	4·48	4·20	4·26	4·28	4·27	4·13	4·04	4·20	4·57	4·41
Lbs. butter-fat.........	546·69	533·28	420·24	343·28	544·53	712·22	833·18	942·96	861·96	747·07	633·64	641·96	7761·01
Lbs. butter...	643·16	627·38	494·40	403·86	640·60	837·90	980·21	1109·36	1014·07	878·90	745·45	755·23	9130 60
Lbs. milk for 1 lb. butter.	18·09	18·11	16 48	19·60	20.90	20·50	20·01	20·19	20·91	21·22	20·74	18·86	19·85

REPORT 2.

INDIVIDUAL COW RECORDS.

Name of Cows.	Age.	Date of dropping last calf.	Number of days in milk.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds butter produced in year.	Value of butter at 20 cts. per lb.	Value of skim milk at 15 cts. per 100 lbs.	Total value of product.	Amount meal eaten, valued at 1c. per lb.	Amount of roots and ensilage eaten, valued at $2 per ton.	Amount hay, valued at $7 per ton.	Months on pasture at $1 per month.	Total cost of feed for year.	Cost to produce 100 lbs. milk.	Cost to produce 1 lb. butter, skim-milk neglected.	Profit on 1 lb. butter, skim-milk neglected.	Profit on cow during year, labour neglected.
			Days.	Lbs.	Lbs.	p. c.	Lbs.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Mos	$ cts.	Cts.	Cts.	Cts.	$ cts.
Queenie ... .(G.G.)	6	Apr. 5, '04	324	19·2	6,250	6·12	450·30	90 06	8 70	98 76	1,596	11,210	941	5	36 97	59·28	8·2	11·8	61 79
Fortune......... (C.)	8	Nov. 27, '04	335	26	8,734	4·56	468·60	93 72	10 89	104 61	2,359	11,960	941	5	45 35	51·92	9·7	10·3	59 26
Zamora.. .... (C.)	8	May 24, '04	327	23·5	7,658	4 91	442·43	88 48	10 67	99 15	1,972	11,960	941	5	41 48	54·16	9·3	10·7	57 67
Jessie A......... (A.)	16	Feb. 15, '04	313	32·2	10,086	3·77	447·85	89 57	14 45	104 02	2,486	12,120	941	5	46 78	46·38	10·4	9·6	57 24
Itchen Lady ..... (G.)	7	May 4, '04	294	26·6	7,782	4·50	412·39	82 47	11 05	93 52	1,906	11,815	941	5	40 67	52·26	9·8	10·2	52 85
Exilée.......... (C.)	9	" 1, '04	334	25·8	8,628	4·10	416·90	83 38	12 31	95 69	2,214	11,960	941	5	43 90	51.21	10·5	9·5	51 79
Countess .. ..(A.G.)	6	Apr. 2, '04	324	25·4	8,258	4	389·41	77 88	11 89	89 77	1,952	11,810	941	5	41 13	49·80	12·1	7·9	48 64
Flossy Lyons..... (G.)	4	Feb. 25, '04	319	20	6,386	5·12	384·92	76 98	9 00	85 98	1,724	11,210	941	5	38 25	59·89	9·9	10·1	47 73
Maggie .... (A.)	8	Mar. 27, '04	300	28·6	8,595	3·76	381·03	76 20	12 02	88 22	1,965	11,810	941	5	41 22	47·09	10·9	9·1	47 00
Bellflower ... ..(G.G.)	6	Apr. 15, '04	275	25·9	7,146	4·32	363·74	72 74	10 17	82 91	1,500	11,815	941	5	36 61	51·23	10·7	9·3	46 30
Polly ....(G.C.)	9	Mar. 24, '04	343	22·3	7,665	4·30	388·56	77 71	10 91	88 62	2,201	11,660	941	5	43 46	56·71	11·1	9·9	45 15
Denty .... (A.)	5	Feb. 6, '04	284	27·1	7,672	4·06	367·28	73 45	10 95	84 40	1,834	11,965	941	5	40 10	52·27	10·9	9·1	44 30
Alma...........(G.G.)	3	" 28, '04	312	20·1	6,291	4·88	361·82	72 36	8 89	81 25	1,776	11,515	941	5	39 07	62·10	10·8	9·2	42 18
Deanie ... . (G.)	7	Aug. 22, '04	366	17·7	6,501	4·90	374·98	74 99	9 18	84 17	2,168	11,815	941	5	43 29	66·59	11·6	8·4	40 88
Ruby........... (G.)	7	Sept. 28, '04	321	18·9	6,084	5·07	363·14	72 62	8 58	81 20	1,982	11,515	941	5	41 13	67·60	11·4	8·6	40 07
Marchioness...... (S.)	10	Mar. 10, '04	321	18·8	6,054	3·75	267·59	53 51	8 68	62 19	1,919	12,332	941	5	41 32	51·30	12	8	20 87
Bloomer .... (A.)	5	" 12, '04	326	22·4	7,311	3·93	338·10	67 62	9 75	77 37	1,775	11,810	941	5	39 36	57·51	11·6	8·4	38 01
Alice..........(G.A.)	3	" 20, '04	352	19·1	6,750	3·87	307·32	61 22	9 66	70 88	1,613	11,480	941	5	37 35	55·33	12·1	7·9	33 53
Laura..........(G.A.)	8	Feb. 9, '04	291	27·5	8,037	3·65	309·90	61 98	11 59	73 57	1,978	11,815	941	5	41 39	51·49	13·3	6·7	32 18
Rosy..........(G.S.)	5	Oct. 5, '03	366	20·7	7,604	3·65	327	65 40	10 91	76 31	2,253	11,815	941	5	44 14	58·05	13·5	6·5	32 17
Janet........... (S.)	3	Nov. 14, '03	290	13·81	5,505	4·4	284·96	56 99	7 83	64 82	2,198	11,815	941	5	43 59	79·18	15·3	4·7	21 23
Gurta .... (A.)	4	" 6, '03	328	18·6	6,130	3·67	265·19	53 03	8 79	61 82	1,923	11,815	941	5	40 84	66·62	15·4	4·6	20 98
Duchess........ (S.)	3	Dec. 13, '03	275	16·56	4,556	4·15	222·44	44 48	6 49	50 97	1,883	10,525	941	5	37 62	82·57	16·9	3·1	13 35
Cherry .... (G.S.)	4	Sept. 14, '04	303	14·8	4,502	4·30	227·98	45 59	6 41	52 00	1,864	11,815	941	5	40 25	89·	17·6	2·4	11 75
Flecky .... (A.)	5	Mar. 14, '04	314	15·1	4,759	3·78	212·06	42 41	6 82	49 23	1,861	11,660	941	5	40 13	84·32	18 9	1·1	9 10
Clatford Spot .... (G.)	10	June 21, '04	308	14·09	4,342	4·27	218·55	43 71	6 18	49 89	2,346	12,125	941	5	45 38	1·04	20·8	.....	4 51
Alvina ....(G.A.)	3	May 22, '04	143	15·5	2,217	4·79	125·05	25 01	3 13	28 14	797	7,500	941	5	25 21	1·13	20·1	.....	2 93
Duchesse........ (C.)	3	July 21, '04	264	14·03	3,705	3·78	164·93	32 98	5 31	38 29	1,399	11,660	941	5	35 45	95·63	21·5	.....	2 84
Average	...	....	309	.....	6,614 4/7	.....	331·58	66 30	9 32	75 63	1,908 5/7	11,582 11/28	929 4/7	5	40 41	.....	.....	.....	35 22

Name of Cows.	Age.	Date of dropping last calf.	Number of days in milk.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds of butter produced in year.	Value of butter at 20 cents per lb.	Value of skim-milk at 15 cents per 100 lbs.	Total value of products.	Amount of meal eaten, valued at 1c. per lb.	Amount of roots and ensilage eaten, valued at $2 per ton.	Amount of hay, valued at $7 per ton.	Months on pasture at $1 per month.	Total cost of feed for year.	Cost to produce 100 lbs. of milk.	Cost to produce 1 lb. butter, skim-milk neglected.	Profit on 1 lb. butter, skim-milk neglected.	Profit on cows during year, labour neglected.	Sex of calf dropped during the year.	Value of calf, or price for which it sold.	Total returns from cow, milk and calf.
			Days.	Lbs.	Lbs.	p. c.	Lbs.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Mos	$ cts.	Cts.	Cts.	Cts.	$ cts.		$ cts.	$ cts.
SHORTHORNS.																						
Marchioness.. (S)	10	Mar. 10, '04	321	18·8	6,054	3·75	267·59	53 51	8 68	62 19	1,919	12,332	941	5	41 32	51·30	12·0	8·0	20 87	Heifer.	v. 75 00	137 19
Janet	3	Nov. 14, '03	290	13·81	5,505	4·4	284·96	56 99	7 83	64 82	2,198	11,815	941	5	43 59	79·18	15·3	4·7	21 23	Bull...	s. 100 00	164 82
Duchess	3	Dec. 13, '03	275	16·56	4,556	4·15	222·44	44 48	6 49	50 97	1,883	10,525	641	5	37 62	82·57	16·9	3·1	13 35	" ...	v. 100 00	150 97
Average	..	....	295	16·39	5,335	4·10	258·33	51 66	7 66	59 32	2,000	11,557	841	5	40 84	71·01	14·7	5·2	21 82		91 66	150 99
AYRSHIRES.																						
Jessie A....	10	Feb. 15, '04	313	32·2	10,086	3 77	447·85	89 57	14 45	104 02	2,486	12,120	941	5	46 78	46·38	10·4	9·6	57 24	Heifer.	v. 75 00	179 02
Maggie..	8	Mar. 27, '04	300	28·6	8,595	3·76	381·03	76 20	12 02	88 22	1,965	11,810	941	5	41 22	47·09	10·9	9·1	47 00	" .	v. 50 00	138 22
Denty	5	Feb. 6, '04	284	27·1	7,672	4·06	367·28	73 45	10 95	84 40	1,834	11,965	941	5	40 10	52·27	10·9	9·1	44 30	2 bulls.	s. 55 00	139 40
Average	..	....	299	29·3	8,784	3·86	398·72	79 74	12 47	92 21	2,095	11,965	941	5	42 70	48·58	10·7	9·2	49·51		60 00	152 55
GUERNSEYS.																						
Itchen Lady......	7	May 4, '04	294	26·6	7,782	4·50	412·39	82 47	11 05	93 52	1,906	11,815	941	5	40 67	52 26	9·8	10·2	52 85	Bull...	s. 30 00	123 52
Flossy Lyons.....	4	Feb. 25, '04	319	20	6,386	5·12	384·92	76 98	9 00	85 98	1,724	11,210	941	5	38 25	59 89	9 9	10·1	47 73	Heifer.	v. 35 00	120 98
Deanie....	7	Aug. 27, '01	466	17·7	6,501	4·90	374·98	74 99	9 18	84 17	2,168	11,815	941	5	43 29	66 59	11·6	8·4	40 88	Bull...	s. 25 00	109 17
Average	..	....	359	21·4	6,889	4·84	390·76	78·14	9·74	87·89	1,932	11,613	941	5	40 73	59 58	10·4	9·5	47 15		30 00	117 89
CANADIANS.																						
Fortune d'Oka ...	8	Nov. 27, '04	335	26	8,734	4·56	468·60	93 72	10 89	104 61	2,359	11,960	941	5	45 35	51 92	9·7	10·3	59 26	Bull...	s. 30 00	123 72
Zamora...... ...	8	May 24, '04	327	23·5	7,658	4·91	442·43	88 48	10 67	99 75	1,972	11,960	941	5	41 48	54 16	9 3	10·7	57 67	Heifer.	v. 50 00	138 48
Exilée	9	" 1, '04	334	25·8	8,628	4·10	416·90	83 38	12 31	95 69	2,214	11,960	941	5	43 90	51 21	10·5	9·5	51 79	Bull...	s. 25 00	108 38
Average	..	....	332	25·1	8,340	4·52	442·64	88·52	11 29	99 81	2,181	11,960	941	5	43 57	52 43	9·8	10·1	56 24		35 00	123 52

Name of Cows.	Age.	Date of dropping last calf.	Number of days in milk.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds of butter produced in year.	Value of butter at 20c. per lb.	Value of skim-milk at 15c. per 100 lbs.	Total value of product.	Amount of meal eaten, valued at 1c. per lb.	Amount of roots and ensilage eaten, valued at $2 per ton.	Amount of hay, valued at $7 per ton.	Months in pasture at $1 per month.	Total cost of food for year.	Cost to produce 100 lbs. milk.	Cost to produce 1 lb. butter, skim-milk neglected.	Profit on 1 lb. butter, skim-milk neglected.	Profit on cow during year, labour neglected.	Sex of calf dropped during year.	Value of calf or price for which it sold.	Total returns from cow, milk and calf.
			Days.	Lbs.	Lbs.	p. c.	Lbs.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Mos	$ cts.	$ cts.	Cts.	Cts.	$ cts.		$ cts.	$ cts.
SHORTHORN GRADES.																						
Rosy	5	Oct. 5, '03	366	20·7	7 604	3·65	327	65 40	10 91	76 31	2,253	11,815	941	5	44 14	58 05	13·5	6·5	32 17	Bull...	5 00	81 31
Cherry..........	4	Sept 14, '04	303	14·8	4,502	4·30	227·98	45 59	6 41	52 00	1,864	11,815	941	5	40 25	89 00	17·6	2·4	11 75	" ..	5 00	57 00
Average......	..	....	334	17·7	6,053	3·97	277·49	55 49	8 66	64 15	2,058	11,815	941	5	42 19	73 52	15·5	4·4	21 96		5 00	69 15
AYRSHIRE GRADES.																						
Countess	6	Apl. 2, '04	324	25·4	8,258	4·	389·41	77 88	11 89	89 77	1,952	11,810	941	5	41 13	49 80	12·1	7·9	48 64	Heifer.	5 00	94 77
Alice	3	Mar. 20, '04	352	19·1	6,750	3·87	307·32	61 22	9 66	70 88	1,613	11,480	941	5	37 35	55 33	12·1	7·9	33 53	Bull...	....	70 88
Laura	8	Feb. 9, '04	291	27·5	8,037	3·65	309·90	61 98	11 59	73 57	1,978	11,815	941	5	41 39	51 49	13·3	6·7	32 18	" ...	....	73 57
Average......	..	....	322	24	7,681	3·84	335·54	67 02	11 04	78 07	1,847	11,701	941	5	39 95	52 20	12·5	7·5	38 11	. ... .	5 00	79 74
GUERNSEY GRADES.																						
Queenie..........	6	Apr. 5, '04	324	19·2	6,250	6.12	450·30	90·06	8·70	98·76	1,596	11,210	941	5	36·97	59·28	8·2	11·8	61·79	Bull...	....	98·76
Bellflower........	6	Apr. 15, '04	275	25·9	7,146	4·32	363·74	72·74	10·17	82·91	1,500	11,815	941	5	36·61	51·23	10·7	9·3	46·30	" ...	....	82·91
Alma............	3	Feb. 28, '04	312	20·1	6,291	4·88	361·82	72·36	8·89	81·25	1,776	11,515	941	5	39·07	62·10	10·8	9.2	42·18	Heifer.	2 00	83·25
Average......	..	....	303	21·7	6,562	5·10	391·95	78·38	9.25	87·64	1,624	11,546	941	5	37·35	57·53	9·9	10·1	50·02	.... ..	2 00	88·30

DAILY RECORDS.

The effort to interest dairymen in the returns from their individual cows has been continued, and many farmers seem to be awakening to a knowledge of the fact that the improvement of the whole herd demands the study of the unit; that is, a close acquaintance with the expenditure upon the individual cow and the returns from the same.

This can be determined in no other way than by keeping an exact record of the daily milk yield and the daily food consumption.

Forms, similar to the following, for keeping a record of the milk yield are still supplied free on application.

DAIRY MILK RECORD.

Herd belonging to ....
Post Office..
Record for week ending.............................

(This form supplied free by Live Stock Division, Central Experimental Farm, Ottawa, Ont).

COWS.

Day.	Time.																	Total for Day.
Sunday........	Morning......																	
	Evening.....																	
Monday..........	Morning......																	
	Evening......																	
Tuesday........	Morning......																	
	Evening......																	
Wednesday...	Morning....																	
	Evening.....																	
Thursday........	Morning......																	
	Evening......																	
Friday..........	Morning......																	
	Evening......																	
Saturday.......	Morning......																	
	Evening......																	
Total......	Week......																	

(Reverse.)

CENTRAL EXPERIMENTAL FARM.

WM. SAUNDERS, *Director.* J. H. GRISDALE, *Live Stock and Agriculture.*

MILK RECORDS.

1. The profitable dairy cow must give over 5,000 pounds of milk each year. To know the value of a cow her total annual yield of milk must be known. The only way to know this is to keep a record of her daily milk yield.

2. The form on the other side of this sheet is intended to help progressive dairy farmers by supplying them with a simple and convenient sheet for the keeping of the milk records of their individual cows. A study of such records will soon indicate which cows should go to the butcher. We would be pleased to receive a summary of your record. If you have no summary forms write us.

3. Such records are being kept by hundreds of successful dairymen to-day. Many of these men attribute their success to the keeping of such records. Why not give the

thing a trial if you are a dairyman? It will increase your milk product. It will lighten your labour, since your interest will be increased in your work, and 'interest lightens labour.' It will show you the unprofitable cow the 'boarder.' You cannot get rid of her too quickly.

4. For weighing the mik a simple spring balance may be secured for from one to three dollars. If your local dealer cannot supply you, write the undersigned for particulars. A small platform scale is fairly convenient, but we find the spring balance preferable.

5. Many farmers keep records of the amount of food fed to individual cows. If you would like to do so, sample forms would be sent free on writing J. H. Grisdale, Agriculturist, Central Experimental Farm, Ottawa, Ont.

EXPERIMENTS WITH DAIRY COWS.

In reporting upon the following experiments with dairy cows, a few introductory remarks are submitted, a careful reading of which will help in understanding the results.

A careful examination of the daily milk records of many cows shows that for from 2 to 3 months the milk flow increases or remains nearly uniform; for the next 3 or 4 months the decrease is at the rate of about 10 per cent, and then till the end of the lactation period the rate of decrease seems to vary very much, some cows decreasing very rapidly, and others very slowly indeed. It is, therefore, rather difficult to say what the normal rate of decrease in milk flow in a given group of cows really should be, even though the dates of calving were known. It would probably be safe, however, to say that 10 per cent per month was the regular rate of decrease, and taking that rate as the basis, some idea of the influence of the different feeds on the milk flow may be formed.

In estimating the values of rations, hay is charged at $7 per ton; ensilage, turnips. mangels and sugar mangels at $2; sugar beets at $3 per ton, and meal at $20 per ton.

The cows in the different experiments were in some cases dry, in other cases far advanced in the lactation period, and in other cases newly calved.

ENSILAGE *VS.* MANGELS.

The cows in these groups were all fairly well advanced in lactation and the experiment was in every way satisfactory, no mishap or untoward circumstance arising. It will be observed that while the mangels were practically no better milk producers than the ensilage, the mangel ration cost 1·2 cents more per diem than the ensilage ration. The table is self-explanatory. The 'summaries' are the averages of the results of group 'C' on mangels and group 'D' on mangels, and the same when on ensilage.

ENSILAGE vs. MANGELS FOR MILK PRODUCTION.

—		Method of Feeding.							
		1st period of 2 weeks.		2nd period of 2 weeks.		3rd period of 2 weeks.		Summaries.	
		Group C.	Group D.	Group C.	Group D.	Group C.	Group D.		
		Number in group, 4.	Number in group, 4.	Number in group, 4.	Number in group, 4.	Number in group, 4.	Number in group, 4.	Summary.	Summary.
		Regular Ration.	Regular Ration.	Ensilage, Hay, Meal.	Mangels, Hay, Meal.	Mangels, Hay, Meal.	Ensilage, Hay, Meal.	Mangels, Hay, Meal.	Ensilage, Hay, Meal.
Average weight to start	Lbs.	....	....	1,024	922	1,044	941	983	982
Average weight at end of 2 weeks	"	....	....	1,044	941	1,071	969	1,006	1,006
Loss — or gain +	"	....	....	+ 20	+ 19	+ 27	+ 28	+ 23	+ 24
Meal fed group in 1 day	"	32	31	30	30	28½	29	29¼	29½
Hay fed group in 1 day	"	12	12	20	20	20	20	20	20
Ensilage and roots fed group in 1 day	"	200	190	....	....	....	....	....	....
Ensilage fed group in 1 day	"	....	....	222	....	....	178	271	200
Mangels fed group in 1 day	"	....	....	....	277	265	....	....	....
Meal fed in 2 weeks	"	448	434	420	420	399	406	409	413
Hay fed in 2 weeks	"	168	168	280	280	280	280	280	280
Ensilage and roots in 2 weeks	"	2,800	2,660	....	....	....	....	....	....
Mangels in 2 weeks	"	....	....	....	3,880	3,710	....	3,795	....
Ensilage in 2 weeks	"	....	....	3,105	....	....	2,495	....	2,800
Value of food fed group in 2 weeks	$	7 87	7 59	8 28	9 06	8 68	7 53	8 87	7 91
Value of food fed 1 cow in 1 day	Cts.	14	13·5	14·8	15·3	15·5	13·5	15·4	14·2
Milk produced by group in 2 weeks	Lbs.	1,204	1,162	1,015½	1,041½	972	991	1,007	1,003
First day's milk from group	"	87½	82	80	79	71½	72½	75	71
Second day's milk from group	"	85½	84½	82½	78½	72	73	75	73
Average daily yield of group during 1st week	"	87	85	75½	75½	70½	70¾	73	73
Average daily yield of group during 2nd week	"	84	82	70	73	69½	70¾	71	70⅓
Average daily yield of group during 2 weeks	"	86	83¾	72½	74¾	70	70¾	72	71⅓
Next to last day's milk from group	"	83	80	69	74	68	68	73	68⅓
Last day's milk from group	"	82	76½	73	74	68	70	73	71⅓
Decrease in rate of daily milk yield in 2 weeks	"	3	5	10	5	4	3	4½	6½
Per cent decrease in rate of daily milk yield	p. c.	3½	6	12½	6	5½	4	5½	8

DRY FORAGE *vs.* SUCCULENT FORAGE.

The cows in group 'E' and 'F' seemed to like the dry forage fairly well, and the group ate about 25 per cent more dry matter when so fed, but the yield of milk fell off very rapidly.

The results seem to indicate quite strongly the advisability of every dairy farmer having some succulent feed to give to his milch cows in addition to the hay and meal.

DRY FORAGE vs. SUCCULENT FORAGE.

—		Method of Feeding.							
		1st period of 2 weeks.		2nd period of 2 weeks.		3rd period of 2 weeks.		Summaries.	
		Group E.	Group F.	Group E.	Group F.	Group E.	Group F.		
		Number in group, 4.	Number in group, 4.	Number in group, 4.	Number in group, 4.	Number in group, 4.	Number in group, 4.	Summary.	Summary.
		Roots and Ensilage, Meal, Hay.	Roots and Ensilage, Hay, Meal.	Dry Feed.	Succulent Feed.	Succulent Feed.	Dry Feed.	Dry Feed.	Succulent Feed.
Average weight to start	Lbs.	......	......	994	972	1,007	1,049	1,022	988
Average weight at end of 2 weeks	"	......	......	1,007	1,004	1,049	1,016	1,011	1,027
Loss or gain, -+	"	......	......	+13	+32	+42	—33	—11	+39
Meal fed group in 1 day	"	30	29	31	30½	29	30	30½	29¾
Hay "	"	12	12	82	20	20	80	81	20
Ensilage and roots fed group in 1 day	"	200	190	......	252	242	......	......	247
Meal fed in 2 weeks	"	420	406	434	427	406	420	427	416
Hay "	"	168	168	1,150	280	280	1,120	1,135	280
Ensilage and roots fed in 2 weeks	"	2,800	2,660	......	3,530	3,388	......	......	3,459
Value of food fed group in 2 weeks	$	7 59	7 25	8 37	8 78	8 42	8 12	8 25	8 60
" 1 cow in 1 day	Cts.	13·5	12·75	15	15·6	15	14·7	14·9	15·3
Milk produced by group in 2 weeks	Lbs.	1,286	1,023½	998	888½	944	819	906	916
First day's milk from group	"	92½	73	90	68	70	60½	75	69
Second "	"	93½	75	85½	68	70½	60½	73	69¼
Average daily yield of milk from group during 1st week.	"	95	74¾	77¾	66	69	58	68	67½
" " " 2nd "	"	90	71¾	65	61¾	66	56	60½	64
" " " 2 weeks	"	92	73¾	71¼	62	67½	57½	64½	65
Next to last day's milk from group	"	89½	69½	67	62½	65½	56	61½	64
Last day's milk from group	"	87	69	69	62½	65½	55	62	64
Decrease in rate of daily milk yield in 2 weeks	"	5	5	20	5½	4½	5	13	5
Per cent decrease in rate of daily milk yield	p. c.	5½	6⅔	22	8	6½	8½	17	7

ROOTS AND ENSILAGE, TURNIPS AND SUGAR MANGELS

and

ROOTS AND ENSILAGE, SUGAR MANGELS AND SUGAR BEETS.

The experiments with sugar beets, sugar mangels and turnips may hardly be said to be as instructive as the previous experiments. They were not carried out quite so fully for two reasons: the supply of sugar beets was quite limited, and the effects of the turnips on the butter was very injurious.

So far as turnips are concerned, the results show them more expensive than ensilage and roots and not much more effective, since the natural rate of decrease is not retarded. They were fed in large quantities and rendered the butter quite unsaleable When fed after the milk was drawn night and morning the effect was not quite so noticeable but still sufficient to render the butter unpalatable.

Sugar beets was the only succulent food fed that succeeded in entirely overcoming the normal rate of decrease and in even turning it into an increase of about 3½ per cent in two weeks. But the cost was increased although the amount fed was less than in the case of sugar mangels.

ROOTS AND ENSILAGE, TURNIPS, SUGAR MANGELS AND SUGAR BEETS.

—	Method of Feeding.					
	Group G.			Group H.		
	1st Period.	2nd Period	3rd Period	1st Period.	2nd Period	3rd Period
	Regular Ration.	Turnips, Hay, Meal	Sugar, Mangels, Hay, Meal	Regular Ration.	Sugar Mangels, Hay, Meal	Sugar Beets, Hay, Meal
	Number in group, 4.	Number in group, 4.	Number in group, 4.	Number in group, 3.	Number in group 3.	Number in group 3.
Average weight to start..........Lbs	....	1,009	1,016	....	1,003	1,002
Average weight at end of 2 weeks.. "	....	1,016	1,051	....	1,002	1,037
Loss — or gain + ... "	....	+7	+35	....	—1	+35
Meal fed group in 1 day.......... "	30	25½	23	22	22½	20
Hay " " .... "	12	20	20	9	15	15
Roots and ensilage fed group in 1 day "	200	....	....	150	....	....
Sugar mangels " " "	....	....	280	....	218	....
Turnips " " "	....	277	....	....	....	....
Sugar beets " " "	....	....	....	....	....	210
Meal fed in 2 weeks.............. "	420	357	322	308	315	280
Hay " .... "	168	280	280	126	210	210
Roots and ensilage fed in 2 weeks.. "	2,800	....	....	2,100	....	....
Sugar mangels " .. "	....	....	3,920	....	3,050	....
Sugar beets fed in 2 weeks .... .. "	....	....	....	....	....	2,940
Turnips " " ..... "	....	3,880	....	....	....	....
Value of food fed group in 2 weeks. $	7.59	8.43	8.12	5.62	6.94	7.94
" " 1 cow in 1 day.... Cts.	13·5	15	14·5	13·3	16·5	18·8
Milk produced by group in 2 weeks Lbs.	928	806	692½	836½	760	835½
First day's milk from group....... "	71½	69½	54	60½	59	57½
Second " " ...... "	71	59½	55	63	57	58½
Average daily yield of group during 1st week .... "	68¼	61	50½	61½	55½	58
Average daily yield of group during 2nd week...................... "	64½	54	48½	57¾	54	61½
Average daily yield of group during 2 weeks. ... . "	66¼	57¾	50	60	54	60
Next to last day's milk from group "	64	53	48½	57	54	60½
Last day's milk from group....... "	62½	55	48	58	56	60
Decrease in rate of daily milk yield in 2 weeks................ "	8	6	6	4½	1	increase 2
Per cent decrease in rate of daily milk yield....................p. c.	11	10	11	7	1½	3½

TWO FEEDS *vs.* THREE FEEDS DAILY.

It is the regular practice here to feed the dairy cows as well as all other cattle twice a day as follows:—roots, ensilage and meal at 5.30 o'clock, first thing in the morning, followed by hay in about an hour and a half, in the afternoon about 3.30 o'clock the other half of the roots and ensilage and meal is given, and shortly after 5 o'clock the rest of the hay is fed. The meal is mixed with the roots and ensilage after it is before the animal and the hay is fed uncut.

Many feeders claim that it is better to feed three times in the day rather than twice even though no more food be fed. The following experiment would seem to indicate that two feeds a day is quite as effective as three feeds.

In lot 'B' one of the cows calved during the preliminary or check fortnight, but as this happened before the real experiment began, it does not affect the results as each group is fed each way.

TWO FEEDS vs. THREE FEEDS DAILY.

	Method of Feeding.						Summaries.	
	1st period of 2 weeks.		2nd period of 2 weeks.		3rd period of 2 weeks.			
	Group A.	Group B.	Group A.	Group B.	Group A.	Group B.	Summary.	Summary.
	2 feeds.	2 feeds.	2 feeds a day.	3 feeds a day.	3 feeds a day.	2 feeds a day.	3 feeds.	2 feeds.
	Number in group, 4.	Number in group, 4.	Number in group, 4.	Number in group, 4.	Number in group, 4.	Number in group, 4.	Number in group, 4.	Number in group, 4.
Average weight to start			1,442½	1,212½	1,461	1,226	1,337 lbs.	1,334
Average weight at end 2 weeks			1,461	1,226	1,462	1,227	1,344 "	1,344
Loss — or gain +			+19	+14	+1	+1	+ 7	+10
Meal fed group in 1 day	29	27	24½	28⅓	25	28	26½ lb.	26¼
Hay "	12	12	20	20	20	20	20	20
Ensilage and roots fed group in 1 day	200	180	277	276	237	250	256	263
Mangels " "								
Turnips " "								
Sugar beets " "								
Sugar mangels " "								
Ensilage " "								
Meal fed group in 2 weeks	406	378	342	399	350	392	374	367
Hay " "	168	168	280	280	280	280	280	280
Ensilage and roots fed group in 2 weeks	2,800	2,520	3,881	3,861	3,320	3,498	3,590	3,689
Value of feed fed group "	$7 45	$6 89	$8 28	$8 83	$7 80	$8 40	$8 32	$8 34
Value of feed fed 1 cow in 1 day	13·25	12·3	14·1cts.	15·8cts.	14cts.	15cts.	15 cts.	14·5
Milk produced by group in 2 weeks	334	529	289 lbs.	743	235	724	439	506
First day's milk from group	26½	39½	22 "	54	18	53	36	37½
Second " "	26	39½	21 "	53½	19	52½	36	37
Average daily yield of group during 1st week	25½	39	21½ "	53¾	17	51½	35½	36½
" " 2nd "	22	36⅓	19½ 2	52¼	16⅓	52	34½	36
" " 2 weeks	24	37¾	20½ "	53	16¾	51¾	34½	36
Next to last day's milk from group	22	33½	19 "	51½	16	50½	34	35
Last day's milk from group	22	33½	18 "	55½	15	51	35	34⅓
Decrease in rate of daily milk yield in 2 weeks	4	6	2 "	—0	3	1	1½	1½
Per cent decrease in rate of daily milk yield	16%	15%	9%		16⅔%	2%	8%	6%

REFUSE APPLES AS FEED FOR MILCH COWS.

Every season the disposition to be made of low grade apples is a matter of more or less moment to many farmers. To be in a position to give some exact data as to their value as food for at least some classes of live stock, a few experiments in feeding them were conducted here in the autumn. Among others was one to study their effect upon milk secretion and upon the health of dairy cattle.

Four grade cows about six months in milk were selected. They were fed on the usual ration of ensilage, pulped roots and hay for two weeks, then put on a ration of meal, hay, ensilage and roots and apples.

Below are submitted a few particulars.

FIRST PERIOD.

NO APPLES.

Number of cows in experiment		4
Average ration fed each cow during 2 weeks previous to apple feeding experiment and 2 weeks after apple feeding experiment.	Ensilage and roots	50 lbs.
	Hay	4 "
	Meal	7½ "
Feed consumed by group in average 2 weeks	Ensilage and roots	2,800 "
	Hay	224 "
	Meal	420 "
Value of feed in average 2 weeks		$ 7.78
Cost to feed 1 cow 1 day		13·9 cts.
Milk yielded by group in average 2 weeks		1,353 lbs.
Daily average for cow during 2 weeks		24·2 "

SECOND PERIOD.

APPLES IN RATION.

Average ration for each cow during 2 weeks on experiment	Apples	25 "
	Roots and ensilage	20 "
	Hay	4 "
	Meal	7½ "
Feed consumed by group in 2 weeks while experiment lasted	Apples	1,400 "
	Roots and ensilage	1,120 "
	Hay	224 "
	Meal	420 "
Value of feed, other than apples, fed during 2 weeks		$ 6.10
Cost to feed one cow 1 day (apples not valued)		10·9 cts.
Milk yielded by group in 2 weeks while eating apples		1,395 "
Daily average for cow during 2 weeks		24·9 "
Difference in milk yield in favour of apple ration, for 2 weeks		42 "
Average weight of cows when going on apple feeding period		985 "
Average weight of cows at end of apple feeding period		1,008 "
Gain in weight on average		23 "
Average weight at end of last 2 weeks		992 "
Loss in average weight during 2 weeks		16 "

It is only fair to credit the refuse apples as being worth the value of the food saved in the 2 weeks. On such a basis, therefore, refuse apples may be valued at $2.40 per ton, or about 7 cents per bushel, when roots and ensilage are valued at $2 per ton for cattle feed.

By way of comment it might be added that the cows seemed to relish the apples, which were of different sorts, and to thrive upon them as shown by the quite considerable gain of 23 pounds per cow made in 14 days while on apples, whereas during the subsequent 2 weeks a loss of 16 pounds per cow is shown. The health of the cows seemed to be very favourably affected by the apples, as might be inferred from the above.

Calves given a few of the apples each day seemed to like them, and did well on them.

BEEF PRODUCTION.

EXPERIMENTS IN 1903-4.

The lines of experiment followed in the winter of 1903-4 were:—Influence of age on cost of beef; influence of manner of housing, *i.e.,* feeding loose vs. feeding tied; baby beef; values of feeds.

On the whole the steer feeding operations may be considered successful from the financial point of view since the selling price covered the cost of the steers, the cost of the feed at market prices, and left a fair margin for profit. Full particulars are given in the group reports.

In conducting feeding operations the farmer may seldom expect to make much over and above market prices for his feeds, but he will, of course, have saved himself the trouble of marketing the feeds and will have retained on his farm a large amount of material for fertilizing purposes without which it is practically impossible to long farm successfully in Canada.

LOOSE VS. TIED.

The experiment of feeding lots of steers loose as compared with feeding similar lots tied has been continued as indicated above and is concluded. The results in 1903-4 are decidedly in favour of loose box feeding. The loose box fed lots gained on the average 311 pounds per steer in 129 days, while the tied steers gained 275 lbs. in 129 days. The loose box steers put on flesh at a cost of $4.76 per 100 lbs., while the tied lots cost $5.39 per 100 lbs. gain in live weight.

Lot 'A'—(Three-year-olds)—Loose.

Number of steers in lot	8	
First weight, gross	9,888	lbs.
First weight, average	1,236	"
Finished weight, gross	12,240	"
Finished weight, average	1,530	"
Total gain in 129 days	2,352	"
Average gain per steer	294	"
Daily gain for lot, 8 steers	18·24	"
Daily gain per steer	2·28	"
Gross cost of feed	$ 122 89	
Cost of 100 pounds gain	5 22	
Cost of steers, 9,888 lbs. at $4 per 100 lbs.	395 52	
Total cost to produce beef, $395.52 + $122..89	518 41	
Sold, 12,240 lbs. at $5 per 100 lbs., less 5 per cent.	581 40	
Profit on lot	62 99	
Net profit per steer	7 87	
Average buying price per steer	49 44	
Average selling price per steer	72 67	
Average increase in value	23 23	
Average cost of feed per steer	15 36	

Amount of meal eaten by lot of 8 steers..........	4,127 lbs.
Amount of ensilage and roots..........	49,728 "
Amount of hay..........	6,328 "
Amount of straw eaten..........	4,872 "

Lot 'B'—(Three-year-olds)—Tied.

Number of steers in lot..........	9
First weight, gross..........	11,097 lbs.
First weight, average..........	1,233 "
Finished weight, gross..........	13,563 "
Finished weight, average..........	1,507 "
Total gain in 129 days..........	2,466 "
Average gain per steer..........	274 "
Daily gain for lot, 9 steers..........	19·08 "
Daily gain per steer..........	2·12 "
Gross cost of feed..........	$ 137 78
Cost of 100 pounds gain..........	5 59
Cost of steers, 11,097 lbs. at $4 per 100 lbs..........	443 88
Total cost to produce beef, $443.88 + $137.78..........	581 66
Sold, 13,563 lbs. at $5 per 100 lbs., less 5 per cent....	644 25
Profit on lot..........	62 59
Net profit per steer..........	6 95
Average buying price per steer..........	49 32
Average selling price per steer..........	71 58
Average increase in value..........	22 26
Average cost of feed per steer..........	15 31
Amount of meal eaten by lot of 9 steers..........	4,662 lbs.
Amount of ensilage and roots..........	55,536 "
Amount of hay..........	7,119 "
Amount of straw eaten..........	5,355 "

Lot 'C'—(Two-year-olds)—Tied.

Number of steers in lot..........	9
First weight, gross..........	9,216 lbs.
First weight, average..........	1,024 "
Finished weight, gross..........	11,709 "
Finished weight, average..........	1,301 "
Total gain in 129 days..........	2,493 "
Average gain per steer..........	277 "
Daily gain for lot, 9 steers..........	19·35 "
Daily gain per steer..........	2·15 "
Gross cost of feed..........	$ 128 40
Cost of 100 pounds gain..........	5 16
Cost of steers, 9,216 lbs. at $4 per 100 lbs..........	368 64
Total cost to produce beef, $368.64 + $128.40..........	479 04
Sold, 11,709 lbs. at $5 per 100 lbs., less 5 per cent....	556 20
Profit on lot..........	59 16
Net profit per steer..........	6 57
Average buying price per steer..........	40 96
Average selling price per steer..........	61 80
Average increase in value..........	20 84
Average cost of feed per steer..........	14 25
Amount of meal eaten by lot of 9 steers..........	4,613 lbs.
Amount of ensilage and roots..........	47,943 "
Amount of hay..........	7,219 "
Amount of straw..........	4,536 "

Lot 'D'—(Two-year-olds)—Loose.

Number of steers in lot	8
First weight, gross	7,736 lbs.
First weight, average	967 "
Finished weight, gross	10,424 "
Finished weight, average	1,303 "
Total gain in 129 days	2,516 "
Average gain per steer	327 "
Daily gain for lot, 8 steers	21·24
Daily gain per steer	2·53
Gross cost of feed	$ 122 89
Cost of 100 pounds gain	4 30
Cost of steers, 7,736 lbs. at $3.90 per 100 lbs	294 00
Total cost to produce beef, $294 + $122.89	416 89
Sold, 10,424 lbs. at $4.85 per 100 lbs., less 5 per cent	480 29
Profit on lot	63 40
Net profit per steer	7 92
Average buying price per steer	36 75
Average selling price per steer	60 03
Average increase in value	23 28
Average cost of feed per steer	15 36
Amount of meal eaten by lot of 8 steers	4,102 lbs.
Amount of ensilage and roots	43,110 "
Amount of hay	6,328 "
Amount of straw eaten	3,032 "

INFLUENCE OF AGE ON COST OF BEEF.

Cost of producing Beef with three-year-olds, two-year-olds, yearlings, six months' calves and new-born calves.

The experiments to gain some data as to the influence of age upon the cost of producing a pound of beef have been continued and are now concluded.

Lots of animals of as nearly uniform type and breeding as possible were selected and fed such rations as were found to suit them best. The roughage ration in each case consisted of roots, ensilage and hay, the concentrates fed to three-year-olds, two-year-olds, and yearlings was gluten meal. The calves were fed a meal ration made up of oats, pease, barley, oil meal and gluten mixed in different proportions at different periods.

Full statements of the particulars in connection with each lot will be found below. A few of the more important particulars are grouped for comparison, as follows:—

Ages.	Daily Gain.	Gain in 129 days.	Cost 100 lbs. Gain.
	Lbs.	Lbs.	$ cts.
Three-year-olds	2·28	294	5 22
Two-year-olds	2·53	327	4 30
Yearlings	1·9	242	5 62
Six month calves	1·75	267	4 48
Skim-milk calves, new born	1·68	360	2 77

INFLUENCE OF AGE OF STEERS ON COST OF PRODUCTION OF BEEF.

Lot 'E'—(Three-year-olds)—Loose.

Number of steers in lot	8	
First weight, gross	9,888	lbs.
First weight, average	1,236	"
Finished weight, gross	12,240	"
Finished weight, average	1,530	"
Total gain in 129 days	2,352	"
Average gain per steer	294	"
Daily gain for lot, 8 steers	18·24	"
Daily gain per steer	2·28	"
Gross cost of feed	$ 122 89	
Cost of 100 pounds gain	5 22	
Cost of steers, 9,888 lbs. at $4 per 100 lbs.	395 52	
Total cost to produce beef, $395.52 + $122.89	518 41	
Sold, 12,240 lbs. at $5 per 100 lbs., less 5 per cent.	581 40	
Profit on lot	62 99	
Net profit per steer	7 87	
Average buying price per steer	49 44	
Average selling price per steer	72 76	
Average increase in value	23 23	
Average cost of feed per steer	15 36	
Amount of meal eaten by lot of 8 steers	4,127	"
Amount of ensilage and roots	49,728	"
Amount of hay	6,328	"
Amount of straw eaten	4,872	"

Lot 'F'—(Two-year-olds)—Loose.

Number of steers in lot	8	
First weight, gross	7,736	lbs.
First weight, average	967	"
Finished weight, gross	10,424	"
Finished weight, average	1,303	"
Total gain in 129 days	2,516	"
Average gain per steer	327	"
Daily gain for lot, 8 steers	21·24	"
Daily gain per steer	2·53	"
Gross cost of feed	$ 122 89	
Cost of 100 pounds gain	4 30	
Cost of steers, 7,736 lbs. at $3.90 per 100 lbs.	294 00	
Total cost to produce beef, $294 + $122.89	416 89	
Sold, 10,424 lbs. at $4.85 per 100 lbs., less 5 per cent.	480 29	
Profit on lot	63 40	
Net profit per steer	7 92	
Average buying price per steer	36 75	
Average selling price per steer	60 03	
Average increase in value	23 28	
Average cost of feed per steer	15 36	
Amount of meal eaten by lot of 8 steers	4,102	lbs.
Amount of ensilage and roots	43,110	"
Amount of hay	6,328	"
Amount of straw eaten	3,032	"

Lot 'G'—(Yearlings)—Loose.

Number of steers in lot	8	
First weight, gross	6,464	lbs.
First weight ,average	808	"
Finished weight, gross	8,400	"
Finished weight, average	1,050	"
Total gain in 129 days	1,936	"
Average gain per steer	242	"
Daily gain for lot, 8 steers	15·2	
Daily gain per steer	1·9	
Gross cost of feed	$ 108 80	
Cost of 100 pounds gain	5 62	
Cost of steers, 6,464 lbs. at $3.50 per 100 lbs.	226 24	
Total cost to produce beef, $226.24 + $108.80	335 04	
Sold, 8,400 lbs. at $4.75 per 100 lbs., less 5 per cent.	379 05	
Profit on lot	44 01	
Net profit per steer	5 50	
Average buying price per steer	28 28	
Average selling price per steer	47 43	
Average increase in value	19 15	
Average cost of feed per steer	13 60	
Amount of meal eaten by lot of 8 steers	4,102	lbs.
Amount of ensilage and roots	38,360	"
Amount of hay	6,104	"
Amount of straw eaten	4,032	"

Lot 'H'—(Calves over 6 months)—Loose.

Number of steers in lot	5	
First weight, gross	1,930	lbs.
First weight, average	386	"
Finished weight, gross	3,265	"
Finished weight, average	653	"
Total gain in 152 days	1,335	"
Average gain per steer	267	"
Daily gain for lot, 5 steers	8·75	"
Daily gain per steer	1·75	"
Gross cost of feed for 152 days	$ 59 83	
Cost of 100 pounds gain	4 48	
Average cost of feed per steer for 152 days	11 96	
Amount of meal eaten by lot of 5 steers	2,674	lbs.
Amount of ensilage and roots	20,377	"
Amount of hay	1,820	"
Amount of straw eaten	980	"
Amount of sugar beet pulp and molasses (dried)	343	"

Lot 'I'—(Calves under 6 months)—Loose.

Number of steers in lot	6	
First weight, gross	740	lbs.
First weight, average	123	"
Finished weight, gross	2,900	"
Finished weight, average	483	"
Total gain in 214 days	2,160	"
Average gain per steer	360	"
Daily gain for lot, 6 steers	10·08	"
Daily gain per steer	1·68	"

Gross cost of feed	$ 59 83
Cost of 100 pounds gain	2 77
Average cost of feed per steer	9 97
Amount of meal eaten by lot of 6 steers	2,361 lbs.
Amount of ensilage and roots	9,240 "
Amount of hay	1,512 "
Green feed	9,408 "

BABY BEEF.

The fourth and fifth lots of calves of the series of baby beef experiments are now under way. It is proposed to end this experiment when the present lots are slaughtered. Since a full discussion of the matter will be necessary when the final lots are reported upon, no comment is made upon the lots now being fed and herewith reported upon up to date.

Lot 'J'—(Yearlings)—Fattening Lot.

Number of steers in lot	5
First weight, gross	1,930 lbs.
First weight, average	386 "
Last weight, gross	4,950 "
Last weight, average	990 "
Total gain in 365 days	3,020 "
Average gain per steer	604 "
Daily gain for lot, 5 steers	8·25 "
Daily gain per steer	1·65 "
Gross cost of feed	$108 46
Cost of 100 lbs. gain	3 59
Average cost of feed per steer	21 69
Amount of meal eaten by lot of 5 steers	4,699 "
Amount of ensilage and roots	40,862 "
Amount of hay	3,370 "
Amount of straw	1,540 "
Amount sugar beet pulp (dried)	378 "

Meal consumed consisted of: Oats, 2,091 lbs.; oil meal, 937 lbs.; bran, 1,027 lbs.; and gluten, 644 lbs.

Lot 'K'—(Yearlings)—Limited Ration Lot.

Number of steers in lot	5
First weight, gross	1,760 lbs.
First weight, average	325 "
Finished weight, gross	3,690 "
Last weight, average	738 "
Total gain in 365 days	1,930 "
Average gain per steer	386 "
Daily gain for lot, 5 steers	5·30 "
Daily gain per steer	1·06 "
Gross cost of feed	$63 68
Cost of 100 lbs. gain	3 30
Average cost of feed per steer	12 73
Amount of meal eaten by lot of 5 steers	898 lbs.
Amount of ensilage and roots	40,370 "
Amount of hay	3,277 "
Amount of straw eaten	1,190 "
Amount of potatoes	816 "
On pasture 6 months	30 mos.

Meal consumed consisted of : Oats, 337 lbs.; gluten, 255½ lbs.; oil meal, 101½ lbs.; bran, 154.

Lot 'L'—(Steer Calves)—Fattening Ration.

Number of steers in lot	6
First weight, gross	740 lbs.
First weight, average	123 "
Last weight, gross	2,900 "
Last weight, average	483 "
Total gain in 214 days	2,160 "
Average gain per steer	360 "
Daily gain for lot, 6 steers	10·08 "
Daily gain per steer	1·68 "
Gross cost of feed	$ 59 83
Cost of 100 lbs. gain	2 77
Average cost of feed per steer	9 97
Amount of meal eaten by lot of 6 steers	2,025 lbs.
Amount of roots and ensilage	9,240 "
Amount of hay	1,512 "
Green feed	9,408 "

Meal consumed consisted of : Oats, 780 lbs.; oil meal, 171 lbs.; barley meal, 336; and bran, 738.

Lot 'M'—(Steer Calves)—Limited Ration Lot.

Number of steers in lot	6
First weight, gross	490 lbs.
First weight, average	81 "
Last weight, gross	2,530 "
Last weight, average	421 "
Total gain in 214 days	2,040 "
Average gain per steer	340 "
Daily gain for lot, 6 steers	9·53 "
Daily gain per steer	1·58 "
Gross cost of feed	$ 57 90
Cost of 100 lbs. gain	2 83
Average cost of feed per steer	9 65
Amount of meal eaten by lot of 6 steers	1,878 lbs.
Amount of ensilage and roots	10,842 "
Amount of hay	1,599 "
Amount of green feed	7,266 "

Meal consumed consisted of : Oats, 780 lbs.; oil meal, 96; barley meal, 273; bran, 729.

SUGAR BEET PULP.

'Improved Molasses Cattle Feed,' the name under which the Dresden Beet Sugar Manufacturing Company placed the combined dried sugar beet pulp and residual molasses from their factory upon the market, is a feed that has received a fairly thorough and very careful test during the past winter months.

Before entering into a full report of the experiments conducted it may be stated in a general way that this preparation is one that, according to shipments received here lacks in uniformity of composition. The molasses would appear to have been mixed with the pulp in an irregular way so that when feeding it to animals there is not likely to be much uniformity in the composition of succeeding portions fed. This

peculiarity is, of course, decidedly objectionable, especially where it is fed in any considerable quantities per diem.

It is objectionable in this, that the effect it will have upon the digestive organs of the animal fed cannot be counted upon. The molasses part of the preparation is somewhat laxative in character and when it is in excess, as occurs occasionally, the animal's digestive organs are more or less deranged for a longer or shorter period. The average feeder would be quite unlikely to note the excess of molasses by looking at the feed.

Where fed in small quantities, say 1 to 3 lbs. per diem, to either calves or mature cattle, however, this peculiarity is of no consequence.

VALUE OF PRODUCT.

We have found the preparation of particular value for feeding to young steers or beef animals. Its value lies in its extreme palatability. It serves to whet the appetite of the otherwise sated fatting calves and induces them to eat not only the portion of Improved Molasses Cattle Feed fed them in excess of the previous ration but quite frequently seems to cause them to eat more of other and possibly more fattening feeds. It is in this direction, that is as an appetiser, that the future of the feed lies, if our experiments count for anything.

EXPERIMENTS WITH DAIRY COWS.

It was fed to dairy cows both in excess of the normal meal ration usually fed and as replacing part of the meal ration. It proved of quite low value in this connection, being apparently equivalent to about half an equal weight of bran as an incentive to greater or even equal milk production.

WITH TWO-YEAR-OLD AND THREE-YEAR-OLD STEERS.

It was used also on some two-year-old and on some three-year-old steers. It was used as an addition to the meal ration and latterly as a substitute for part of the meal ration. In neither case did it prove to be equal to more than about half its weight of bran or other concentrate ration. It was of value, however, in improving the appearance of the cattle, giving them a sleek look scarcely attainable otherwise.

AS ROUGHNESS.

An experiment to determine its value as a substitute for roots or ensilage was conducted and the results are given:—

Nine three-year-old steers were chosen and divided into three groups of three each.

Lot 1. Received no improved molasses cattle feed.

Lot 2. Received 8 lbs. improved molasses cattle feed per diem and half amount other roughness fed Lot 1.

Lot 3. Received 12 lbs. improved molasses cattle feed and 4 lbs. straw per diem.

All lots received equal amounts of long hay and meal.

Particulars are as follows :—

Lot 1. Receiving no improved molasses cattle feed—

		Lbs.
First weight, December 28, 1903	Total	3,880
	Average	1,293
Last weight, March 22, 1904	Total	4,380
	Average	1,460
Gain in 83 days	Total	500
	Average	167
Daily rate of gain per steer		**2**

Three steers consumed of roughness—

	Lbs.	Per ton.	Value.
Ensilage	8,106	$2 00	$8 11
Roots	1,621	2 00	1 62
Straw	996	4 00	1 99
Total cost of roughness used			$11 72

Cost of roughness used in producing 1 lb. increase in live weight, 2·35 cents.

Lot 2. Receiving 8 lbs. improved molasses cattle feed and one-half other roughness—

		Lbs.
First weight, December 28, 1903	Total	4,115
	Average	1,372
Last weight, March 22, 1904	Total	4,730
	Average	1,577
Gain in 83 days	Total	615
	Average	205
Daily rate of gain per steer		2·47

Three steers consumed of roughness:—

	Lbs.	Per ton.	Value.
Ensilage	4,053	$ 2 00	$ 4 05
Roots	810	2 00	0 81
Straw	498	4 00	1 00
Improved molasses cattle feed	1,992	15 00	14 94
Total cost of roughness used			$20 80

Cost of roughness used in producing 1 lb. increase in live weight, 3·38 cents.

Lot 3 Receiving 12 lbs. improved molasses cattle feed and 4 lbs. straw per diem—

		Lbs.
First weight, December 28, 1903	Total	3,990
	Average	1,330
Last weight, March 22, 1904	Total	4,455
	Average	1,485
Gain in 83 days	Total	465
	Average	155
Daily rate of gain per steer		1·87

	Lbs.	Per ton.	Value.
Improved molasses cattle feed	2,928	$15 00	$21 97
Straw	996	4 00	1 99
Total cost of roughness used			$23 96

Cost of roughness used in producing 1 lb. increase in live weight, 5·15 cents.

From the above data it is evident that where 8 lbs. Improved Molasses Cattle Feed took the place of half the straw, roots, and ensilage, it may be said to have been worth $5.86 for 1,992 lbs., or about $5.90 per ton.

In the case of lot 3, where 12 lbs. was fed per diem, a slightly higher value is indicated, namely, $6.30 per ton.

UVECO FOR BEEF PRODUCTION.

Uveco, a prepared food (see page 74), was fed in small quantities to a number of steers and all seemed to be very fond of it. The supply was limited, however, and so it was possible to feed only two steers with this food as an exclusive grain ration.

Two small steers put upon this feed as an exclusive meal ration on April 14, weighed together 1,685 lbs. on that date. They thrived very well and on May 30, 45 days after starting, weighed 1,810 lbs., a gain of 125 lbs. for the pair, or 62½ lbs. per steer, which was at the rate of about 1·4 lb per diem.

The meat from these steers was of very excellent quality, due in some measure no doubt to the good quality of the food fed.

So far as gains are concerned, it will of course be noted that much larger daily gains were quite possible.

PORK PRODUCTION.

PIG FEEDING EXPERIMENTS.

A large number of pigs have been fed during the year. Most of them were pastured for a shorter or longer time on hog lands. (See plan and report, page 80).

These experiments in pasturing are incomplete and will be reported upon at a later date.

WINTERING SOWS OUTSIDE VS. INSIDE.

Where much pasturing of pigs is carried on the wintering of the sows and the fall litters is always a problem of considerable difficulty, since the full utilization of pastures requires pigs ready to turn out at an early date in the spring.

During the past winter a number of the brood sows were housed in the small single board cabins used on the pastures in summer. They did well and were healthy, but cost about 25 per cent more to maintain in good condition than did their mates housed in the regular brood sow run or house.

WINTERING YOUNG PIGS OUTSIDE VS. INSIDE.

A study was also made of the comparative economy of feeding fall pigs outside and inside.

Below is a statement of the results secured. There were two lots inside and two lots outside. The lots were from two different litters, some from each being inside and the rest outside.

YOUNG PIGS WINTERED INSIDE vs. OUTSIDE.

—	Lot 1.	Lot 2.	Lot 3.	Lot 4.	Lots 1 & 3.	Lots 2 & 4.
Location	Inside.	Outside.	Inside.	Outside.	Inside.	Outside.
Number of pigs in lot	5	4	4	7	9	11
Number of days on feed . . . Days	60	60	60	60	60	60
Description of ration fed . . . Lbs.	Shorts 100 Gluten 100	Shorts 100 Gluten 100	Oil meal 100 Shorts 400	Shorts 400 Oil meal 100	Mixed meals.	Mixed meal as inside.
Pounds of mixture required for 100 lbs. gain	417	552½	280	502	365½	526
Amount fed in period . . . Lbs.	993	1,071	400	1,265	1,393	2,336
Value . . . $	10.67	11.51	4.00	12.65	14.67	24.16
Gain made by lot . . . Lbs.	238	192	143	252	381	444
Average gain per pig . . . "	48	48	35¾	36	42⅓	40½
Average rate of gain per diem. "	.82	.80	.6	.6	.70	.68
Cost of 100 lbs. increase in live weight . . . $	4.48	6.00	2.80	5.02	3.85	5.42
Health and appearance	Good.	Good.	Good.	Good.	Good.	Good.
Weight of lot to start . . . Lbs.	496	400	181	331	677	731
Average weight to start . . . "	99	100	45¼	47	75	66½
Weight of lot at finish . . . "	734	592	324	583	1,058	1,175
Average weight at finish . . . "	147	148	81	83	117½	107

RAISING YOUNG PIGS.

A problem that confronts the farmer who wishes to go heavily into bacon production is the raising of young pigs to the age of 3 or 4 months without the help of skim-milk or whey. This difficulty is more particularly noticed in winter or autumn. To gain some information as to the probably best meal mixtures for the purpose, two experiments were tried in January, February and March, 1904. One was conducted outside with pigs housed in small cabins, as mentioned above, and the other inside the regular piggery.

In determining the value of a meal mixture the items to be considered are the rate of gain and the cost of 100 pounds increase in weight.

OUTSIDE FEEDING.

An examination of the reports of the experiments carried on outside, submitted below, shows that a mixture of shorts 4 parts and oil meal 1 part produced pork for $5.02 per 100 pounds at the rate of 6-10ths of a pound per day. Shorts and gluten meal equal parts produced pork at a more rapid rate, viz.: 8-10th pounds per day, but at a slightly higher cost, viz., $6 per 100 pounds. The difference may have been due to the difference in the age of the pigs. A mixture of shorts and oil meal equal parts gave very poor results since it cost $7.93 to produce 100 pounds live weight at the rate of 47-100th pounds per pig per day.

INSIDE FEEDING.

When similar feeds were fed inside much better results were noted. Both the rate of gain per day being slightly increased and the cost of production lowered. The mixture of shorts 4 parts and oil meal 1 part was again to the fore, as gains were made at a cost of $2.80 per 100 pounds gain and at the rate of 6-10th pounds per pig per day.

RATIONS FOR YOUNG PIGS OUTSIDE.

—	Lot 3.	Lot 4.	Lot 6.	Lot 7.	Lot 8.	Lot 9.
Number of pigs in lot	4	4	6	7	4	4
Location	Outside.	Outside.	Outside.	Outside.	Outside.	Outside.
No. of days on feed	60	60	60	60	60	60
Description of ration fed... Lbs.	Shorts 100 Gluten 100	Shorts 100 Oil meal 100	Oats 200 Shorts 100	Shorts 400 Oil meal 100	Oats 100 Shorts 200	Shorts 400 Oil meal 100 Gluten 100 Skim-milk 4½ lbs. per d.
Pounds of meal mixture required for 100 lbs. gain	552½	721	600	502	600	Meal 281½ Milk 766
Amount fed in period... Lbs.	1,071	808	1,080	1,265	1,176	Milk 1,134 Meal 417
Value... $	11.51	8.88	10.80	12.65	11.76	5.49
Gain made by lot... Lbs.	192	112	180	252	196	148
Average gain per pig... "	48	28	30	36	28	37
Daily rate of gain... "	.8	.47	.5	.6	.47	.62
Cost of 100 lbs. increase in live weight... $	6.00	7.93	6.00	5.02	5.70	3.82
Health and appearance	Good.	Good.	Good.	Good.	Fair.	Excellent.
Weight of lot to start... Lbs.	400	155	384	331	556	256
Average weight to start... "	100	38·7	64	47	81	64
Weight of lot at finish... "	592	267	564	583	762	403
Average weight at finish... "	148	66·7	94	83	109	101

RATIONS FOR YOUNG PIGS INSIDE.

—	Lot 1.	Lot 2.	Lot 3.	Lot 4.	Lot 5.
Number of pigs in lot	5	4	5	4	5
Location	Inside.	Inside.	Inside.	Inside.	Inside.
Number of days on feed	40	40	60	60	60
Description of ration fed	Oil meal 200, Shorts 200, Gluten 200, Oats 200, Skim-milk 4½ lbs. a day	Shorts. Skim-milk.	Shorts 100 Gluten 100	Shorts 400 Oil meal 100	Oats 100 Oil meal 100
Pounds of mixture required for 100 pounds gain ... Lbs.	190 meal, 564 skim-milk.	152 meal, 564 skim milk.	417	280	322
Amount fed in period ... "	252 meal, 750 milk.	204 meal, 756 milk.	993	400	699
Value ... $	3.94	2.96	10.67	4.00	8.04
Gain made by lot ... Lbs.	133	134	238	143	217
Average gain per pig ... "	26½	33½	48	35¾	44¼
Average rate of gain per day ... "	.66	.84	.82	.6	.74
Cost of 100 lbs. increase in live weight ... $	2.94	2.21	4.48	2.80	3.70
Health and appearance	Very good.	Excellent.	Good.	Good.	Good.
Weight of lot to start ... Lbs.	183	122	496	181	379
Average weight to start ... "	36½	30½	99	45¼	76
Weight of lot at finish ... "	316	256	734	324	595
Average weight at finish ... "	63	64	147	81	119

STOCK FOODS FOR PORK PRODUCTION.

In August, 32 pigs, ranging in weight from 43 to 80 pounds were divided into 8 groups of 4 pigs each, and for the next 90 days fed experimentally. In each case the individuals in a group were nearly uniform in size. The groups, however, showed considerable difference in their total weights, the heaviest group weighing 300 pounds or 75 pounds per pig, while the lightest group weighed 180 pounds or 45 pounds per pig. It was not possible to secure a more uniform lot at the time and it was considered better to have considerable difference in the total weights of the lots rather than to have some large and some small pigs in each lot.

The experiments lasted 90 days. During that time the pigs were confined in pens with small floored yards attached. Lots 7 and 8, however, were outside, lot 7 having a small unfloored yard and a cabin wherein to sleep, while lot 8 had a clover pasture of about ⅛ acre area and a cabin wherein to sleep.

The results speak for themselves, but it will be noticed that all supplementary foods fed other than skim-milk and pasture, had the effect of raising the cost of production. Skim-milk on the contrary lowered the cost very materially, and pasture had a similar effect in a lesser degree. The meal used was a mixture of half shorts and half mixed grains, oats, pease and barley.

In estimating the cost of production the meal ration is valued at $1 per 100 pounds, the skim-milk at 15 cents per 100 pounds, and the supplementary foods or stock foods at the cost of the same on the Ottawa markets, viz., Anglo-Saxon Stock Food, 10 cents per pound, International Stock Food, 15 cents per pound, Herbageum, 12½ cents per pound and Sugar and Flax 2½ cents per pound. Pasture is not valued, but its value may be deduced from the data given.

STOCK FOODS FOR PORK PRODUCTION.

Lot	1	2	3	4	5	6	7	8
Description of Ration	Meal, Inside.	Meal, Anglo Saxon Stock Food.	Meal, Internation'l Stock Food.	Meal, Sour skim-milk.	Meal, Herbageum.	Meal, Sugar and Flax.	Meal, Outside.	Meal, Pasture Clover and Rape.
No. of Pigs	4	4	4	4	4	4	4	4
No. of days on feed	90	90	90	90	90	90	90	90
Total weight to start	300 lbs.	206 lbs.	208 lbs.	180 lbs.	220 lbs.	240 lbs.	204 lbs.	250 lbs.
Average weight to start	75 "	51½ "	52 "	45 "	55 "	60 "	51 "	62½ "
Total weight at end of experiment	725 "	565 "	541 "	612 "	673 "	711 "	657 "	653 "
Average weight at end of experiment	181¼ "	141¼ "	135¼ "	153 "	168 "	178 "	164 "	163 "
Amount meal eaten	1,860 "	1,551 "	1,456 "	1,275 "	1,781 "	1,880 "	1,942 "	1,741 "
Amount other food	....	80 "	42 "	1,335 "	45 "	322 "	....	Pasture.
Total gain of lot in 90 days	425 lbs.	359 "	333 "	432 "	453 "	471 "	453 lbs.	413 lbs.
Amount meal required for 100 lbs. gain	438 "	432 "	437 "	295 "	393 "	399 "	431 "	421 "
Amount other food for 100 lbs. gain	....	22 "	12 "	309 "	10 "	68 "	....	Pasture.
Cost of 100 lbs. gain	$4.38	$6.52	$6.17	$3.42	$5.15	$5.69	$4.31	$4.21
Daily rate of gain per pig	1·171 lbs.	1·00 lbs.	·925 lbs.	1·20 lbs.	1·25 lbs.	1·31 lbs.	1·25 lbs.	1·15 lbs.
Total gain per pig in 90 days	106¼ "	89¾ "	83¼ "	108 "	113¼ "	117¾ "	113¼ "	103¼ "

The Anglo-Saxon Stock Food, the International Stock Food and Herbageum were all fed according to manufacturers' directions both as to quantity to feed and method of feeding.

UVECO VS. SHORTS AND OATS FOR PORK PRODUCTION.

In the winter of 1904 a shipment of a prepared food called 'Uveco' was received from 'Uveco Cereals, Ltd., Usk Vale Mills, Newport, Mon., England.

This food looked as though it might have been prepared from Indian corn by cooking or steaming and then passing between heated rollers while still wet. It was fed to a lot of 3 pigs for 7 weeks, with results given below. At the same time a similar lot of pigs was fed on an equal amount of a mixture of equal parts shorts and crushed oats.

	Uveco.	Shorts and Oats.
Weight of pigs to start May 5	239	239
Average weight	79⅔	79⅔
Weight of pigs, July 11	405	363
Average weight of July 11	135	121
Increase in weight in lot	166	124
Gain per pig in 49 days	55	41
Daily rate of gain	1·12	·84
Amount food consumed	533	533
Value of food required for 100 lbs. gain		$ 4 08

An examination of the table shows that while 430 pounds of shorts and oats was required to produce 100 pounds increase in live weight, only 321 pounds of Uveco was required to secure a similar result. If 430 pounds of shorts and oats be worth $4.08 it is evident that 321 pounds of Uveco may be claimed to be worth the same amount, *i.e.*, Uveco may be said to be worth $1.27 per 100 pounds.

This is of course a single trial and no definite conclusion should be based upon the results.

The food was evidently very palatable as the pigs ate it with avidity, and when it was fed in small quantities to young pigs they always seemed to want more of it than of any of the regular meals fed.

The keenness of appetite for the food wore off as the experiment advanced, however, and it seemed evident that some other food would have to be fed along with the Uveco if a long feeding period were intended.

LARGE BLACKS.

For a number of years Large Blacks have been bred on the farm to gain some information as to their value as a class of swine for bacon production. They have been tested in various ways, and the results may be summarized as follows:—

1. As prolific and healthy breeding stock they cannot be surpassed by any of the breeds now commonly bred in Canada.

2. As pigs for crossing they are exceedingly impressive whether male or female, and leave their mark stamped very distinctly no matter what the other cross may be. The cross-breds have also been uniformly healthy and quick feeders, the cross with the Tamworth being particularly remarkable in this respect.

3. As pure-bred pigs they have been found to be rapid and easy fatteners, exceedingly good grass or pasture pigs, and have stood all kinds of weather without any apparent evil effects.

4. As pigs for bacon production, however, they have proven to be a complete failure. The carcases have been invariably scored as falling far short of the ideal in (*a.*) quality of meat, (*b.*) uniformity of fat layer on the back, (*c.*) length of side, (*d.*) too little thickness of belly meat and too great a proportion of belly meat to the rest of the carcase, and (*e.*) a marked tendency to lay on fat thickly rather than develop a large amount of lean meat.

A pair was exhibited at the Guelph Fat Stock Show in December, 1903, and experts from the largest packing houses were at one in condemning them for the reasons I have given above.

COMPARATIVE Statement of Crops on '200 Acre Farm,' from 1899 to 1904, inclusive. (200 Acre Farm includes 7 Acres of Roa ls.)

Year.	Grain.		Hay.		Roots and Corn.		Pasture.		Soiling Crop.		Pig Pasture.		Remarks.
	Area in Acres.	Yield in Pounds.	Area in Acres.	Yield in Tons.	Area in Acres.	Yield in Tons.	Area in Acres.	Number of Cattle.	Area in Acres.	Disposition of Crops.	Area in Acres.	Crops Grown for Pasture.	
1899	73	118,466	39	93	40	326½	40	36	1	Fed to dairy cows	....	....	Generally considered a good year for all crops.
1900	80	126,621	53	138	40	743	20 and aftermath	49	....	....	..	....	Season very favourable for most crops.
1901	79	114,472	58	210	40	702	16 and aftermath	52	....	....	...	....	Season very favourable for most crops.
1902	74	144,914	60	216	39	665	20 and aftermath	62	....	....	5	Clover, rape and aftermath.	Season favourable for hay, bad for corn.
1903	69	126,619	62	154	34	473	16 and aftermath	96	5	Dairy cows, bulls and calves.	6	Clover and rape.	Season very unfavourable for most crops, particularly adverse to corn and roots. No second crop hay.
1904	67	112,009	60	192	46¾	674	13·75	98	3	Dairy cows, bulls and calves.	3	Clover and rape.	Season unfavourable for grain and corn, good for hay and roots.

The variety of crops grown and the varying areas under each crop each year make it quite difficult to make a comparison of the returns of the different years, so to simplify matters I would suggest that a fixed valuation be put upon the products, and the returns of each year valued accordingly.

Fixing prices as follows : Grain, $1 per 100 lbs.; roots and ensilage, $2 per ton; hay, $7 per ton; pasturing cattle, $8 per season: and area under pigs, $15 per acre; the returns from the '200 Acre Farm' for the years mentioned may be said to have been worth $2,776.66 in 1899; $4,110.21 in 1900; $4,434.72 in 1901; $4,787.14 in 1902; $4,148.19 in 1903; $4,741.09 in 1904.

UTILIZATION OF FEED.

An examination into the supply of feed produced on the '200 Acre Farm,' the experimental plots of roots and corn, and the meal or grain purchased for use in the barns, together with a detailed statement of the disposal thereof, and a statement of the kinds of grain and meal consumed from July 1, 1903, to June 30, 1904, follows :—

SUMMARY of Feed of all kinds used for Stock on 200 Acre Farm from July 1, 1903, to June 30, 1904.

——	Straw.	Grain or Meal.	Roots and Ensilage.	Hay.
	Lbs.	Lbs.	Lbs.	Lbs.
Grown on 200 Acre Farm, (crop of 1903)	120,000	106,621	900,000	304,000
Received from Experimental Department	10,000	....	217,745	
Received from Distribution Division (refuse grain)	....	39,318		
Purchased	110,000	249,863	....	8,000
Total	240,000	395,802	1,117,745	312,000

DISPOSITION of Feed harvested on, and bought for use of Live Stock on 200 'Acre Farm.'

Class Fed.	Hay.	Grain and Meal.	Corn and Roots.	Feeding Straw.	Bedding Straw.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
19 horses	130,000	115,512	3,000	....	28,000
81 steers	37,393	36,107	340,400	24,563	50,600
38 milch cows, all breeds	53,480	63,144	344,128	15,460	30,650
40 young stock and bulls, all breeds	40,500	15,680	200,040	20,478	30,480
75 sheep	20,500	9,041	5,000	....	5,000
400 swine	....	110,500	25,000	....	20,000
Poultry division	....	21,615	2,700	....	13,950
Loss by experimental curing	4,000	....	5.500	....	....
Total accounted for	285,873	371,599	925,768	60,501	178,680
Amount harvested and received	312,000	395,802	1,117,745	....	....
Shrinkage or loss	26,127	24,203	191.977	....	....
Percentage shrinkage or loss	8·38%	6·12%	17·17%	....	....

The meal consumed consisted of :—

	Lbs.
Oats	168,777
Barley	3,761
Bran	81,549
Shorts	76,101
Gluten meal	27,000
Mixed grain (oats, pease, barley)	23,399
Corn meal	956
Oil meal	5.400
Uveco	2,717
Other special feeds	6,142
Total	395,802

BALANCE SHEET OR FINANCIAL STATEMENT OF LIVE STOCK FEEDING OPERATIONS ON 200 ACRE FARM, JULY 1, 1903, TO JUNE 30, 1904.

In compiling the following table, the figures in the columns headed 'Value' in both 1903 and 1904 represent either the cost price of the animals included, where recently bought, or the fair merchantable price of the same at the date of valuation.

Under the heading 'Returns' are included values of products and services during the year.

LIVE STOCK INVENTORIES.

—	July 1, 1903.		June 30, 1904.				Gross returns made up of increase in value, value of products and animals sold.
	Number on hand.	Value.	Number handled during year.	Number on hand.	Value.	Returns of all descriptions.	
		$ cts.			$ cts.	$ cts.	$ cts.
Horses	19	....	....	19	....	2,630 00	2,630 00
Shorthorns—Pure-breds (15) and grades (3)	20	3,410 00	25	18	3,495 00	726 29	811 29
Ayrshires—Pure-breds (18) and grades (10)	30	2,410 00	39	28	2,560 00	1,240 50	1,390 50
Guernseys—Pure-breds (13) and grades (10)	23	1,956 00	28	23	2,040 00	1,160 72	1,244 72
Canadians—Pure-breds (8) and grades (2)	9	895 00	14	10	1,075 00	542 40	622 40
Steers	67	2,307 00	67	22	440 00	3,005 50	1,138 50
Sheep	64	935 00	96	66	1,020 00	160 00	245 00
Swine	255	2,040 00	405	260	2,090 00	1,860 55	1,910 55
Total	....	13,953 00	....	446	12,720 00	11,325 96	9,992 96

SUMMARY.

RETURNS.

Gross returns from animals of all classes, including value of products, value of services and increase in value of young stock	9,992 96
Manure, 1,100 tons	1,100 00
	$11,092 96

EXPENDITURE.

Value of Food Consumed.

Meal		$3,560 89
Hay		1,078 00
Roots and ensilage		1,109 54
Whole milk, 17,640 lbs		176 40
Skim-milk, 180,000 lbs		270 00
		6,194 83
Straw, 112 tons at $4 per ton		448 00
Cost of labour in connection with care of horses, cattle, sheep and swine:—		
Herdsman	$660 00	
Two men at $480	960 00	
Three men at $432	1,296 00	
Extra help, teaming, &c	461 40	
	$3,377 40	3,377 40
		$10,020 23
Balance		1,072 73

It will be noted that the clear profit after all items have been paid is rather small when the number of animals is considered. It must be remembered, however, that all feeds are charged at market prices and no allowance made for shrink or loss in curing; further, that straw for bedding, &c., is charged at $4 per ton. The wage item in connection with the care and feeding is likewise open to criticism, but may be explained as follows. In the first place, experimental feeding demands more time and a higher class service than is generally used by farmers; in addition, proximity to Ottawa raises the wage rate, and lastly, the buildings and facilities for feeding and caring for the stock are not nearly so good as they should be.

ROTATION EXPERIMENT.

For five years, from 1899 to 1903, inclusive, the '200-acre farm' has been cropped under a rotation of five years' duration as follows: Clover hay; Timothy or mixed hay or pasture; grain, 10 pounds Red Clover for fertilizing purposes; corn or roots; grain, 8 pounds Red Clover, 10 pounds Timothy seed for meadow.

The results have been very interesting, since the aggregate annual crop returns from the farm seemed to have been materially increased. The fact that a rotation

of the character described above seemed to help increase the crop returns from a given area and at the same time increase the fertility of that area, has led to the putting under way of a number of rotations of different lengths, with different crops in different orders and with different purposes in view.

It is not possible this year to explain or outline the whole scheme, but brief descriptions of the rotations, the areas devoted to each and the results obtained from each field, are submitted herewith.

The rotations are as follows:—

Rotation A.—Five years, Clover hay, Timothy hay, grain, corn, grain.

Rotation B.—Five years, Clover hay, grain, Clover hay, corn, grain.

Rotation E.—Three years, pasture, corn, grain.

Rotation Z.—Three years, Clover hay, corn, grain.

Rotation S.—Four years, shallow cultivation, Clover hay, Timothy hay, roots, grain.

Rotation D.—Four years, deep cultivation, Clover hay, Timothy hay, roots, grain.

Rotation H.—Three years, hog pasture, roots, grain or soiling crop.

Rotation T.—Four years, sheep pasture, roots and soiling crop, grain, Clover hay.

Rotation M.—Six years, grain, grain, Clover hay, Timothy hay for three years.

Rotation N.—Six years, grain, grain, Timothy hay for four years.

Rotation O.—Three years, grain, Timothy hay, Timothy hay.

Rotation P.—Three years, grain, Clover hay, Timothy hay.

In the descriptions of the rotations and fields that follow, an effort is made to give as concisely as possible the location of each field, its size, the character of its soil, its drainage and its general crop history.

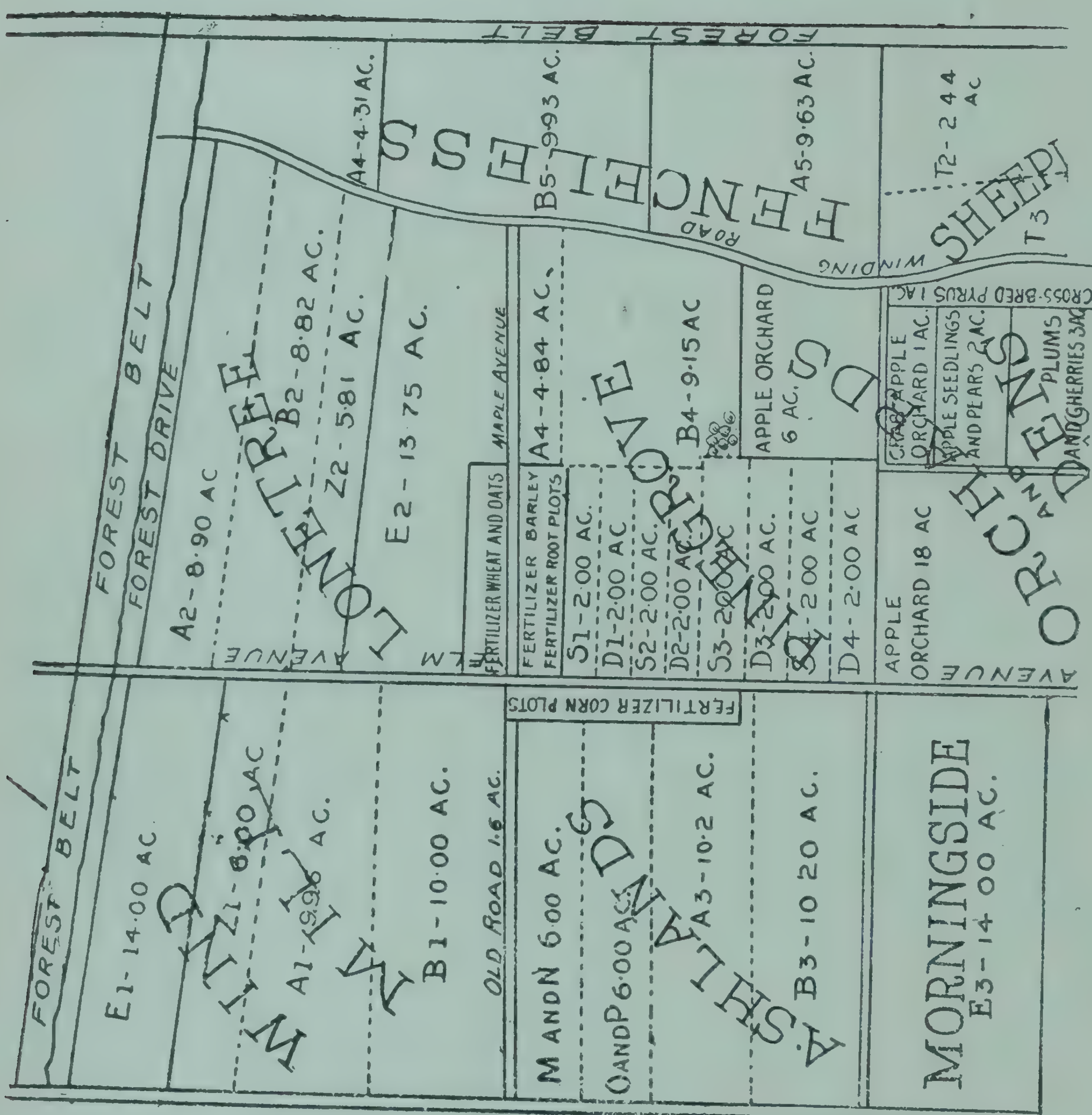
In the tables will be found all items of expenditure. The manure is applied in the same ratio to each field in each rotation. To illustrate: if to the corn land in Rotation 'Z,' 15 tons of manure per acre is applied; this is equivalent to 5 tons per acre per annum, as Z is a three year rotation. Then in applying manure to M, 30 tons per acre would be applied, as M is a six year rotation. Since the manure must vary slightly in quantity each year, $3 per annum per acre is charged in each rotation.

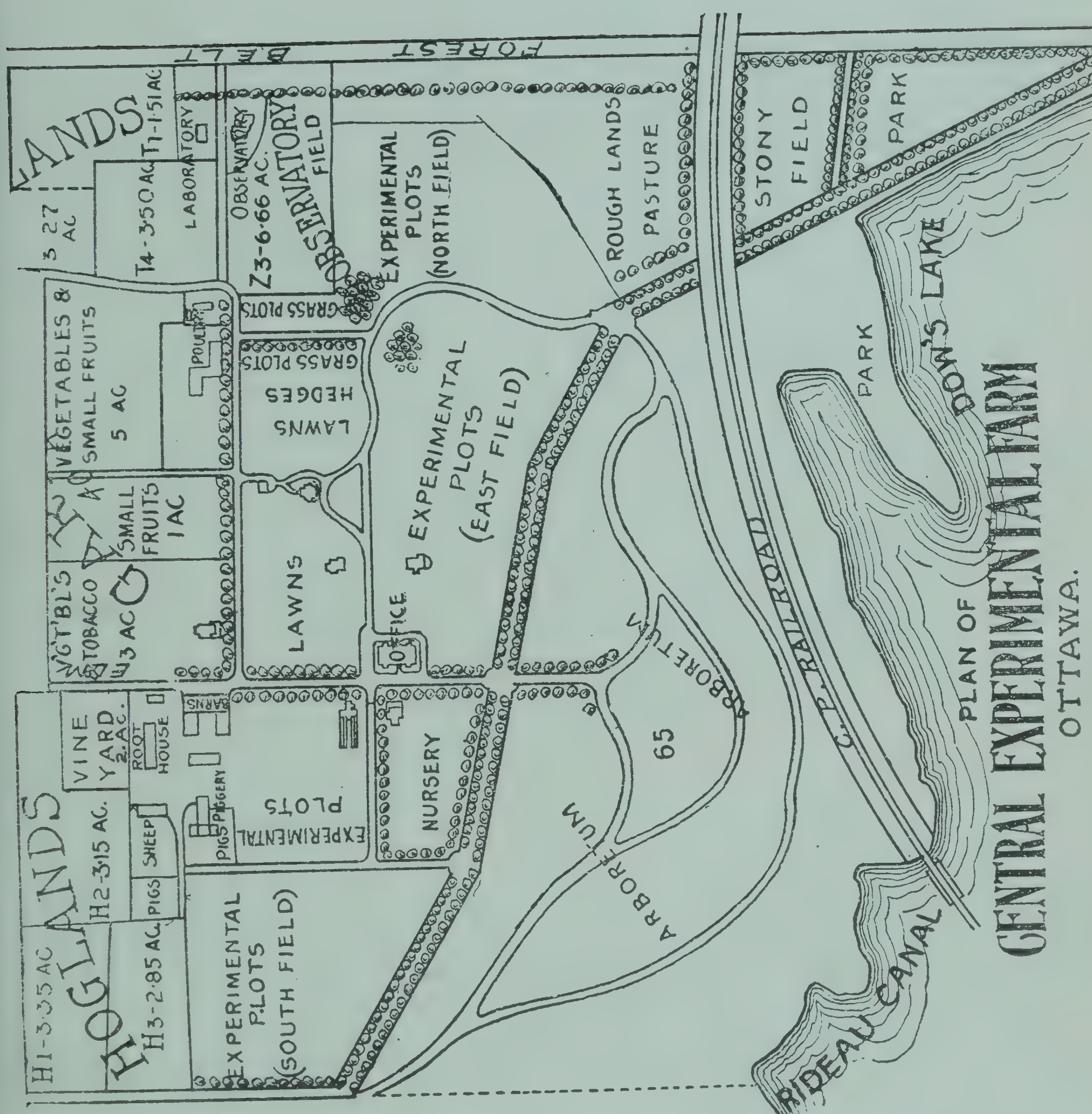
The total amount of each kind of crop material is divided so as to show the production capacity of one acre under each rotation.

ROTATION 'A.'

This rotation of five years' duration includes grain, Clover hay, Timothy or mixed hay, grain and corn in the order named. The grain crop mentioned first comes after corn. The corn stubble is torn up with a strong stiff-toothed cultivator run across, and angling to both right and left, of the direction of the rows. The surface soil and roots so loosened up are then ridged up in drills about 21 inches apart and 8 inches high. The drills are broken down the next spring by means of the disc harrow or stiff-toothed cultivator, harrowed once, and the field is ready to sow. Red clover 8 pounds, Alsike clover 1 pound, and Timothy seed 10 pounds per acre, is sown with the grain, and the land then rolled.

The clover field is mown as early as possible to insure a second crop. The mixed hay or Timothy is cut just as the bloom fades away, and a second cut is taken if growth warrants the expense of cutting. In any case the land is ploughed 4 inches deep about the end of August.


FOREST BELT
FOREST DRIVE
FENCELESS
LONE TREE
MORNINGSIDE
WINDING ROAD
ELM AVENUE
MAPLE AVENUE
OLD ROAD 1.6 AC.
A4-4·31 AC.
B5-9·93 AC.
A5-9·63 AC.
T2-2 44 AC
A2-8·90 AC
B2-8·82 AC.
Z2-5·81 AC.
E2-13 75 AC.
A4-4·84 AC.
B4-9·15 AC
APPLE ORCHARD 6 AC.
CROSS-BRED PYRUS 1 AC.
APPLE ORCHARD 1 AC.
APPLE SEEDLINGS AND PEARS 2 AC.
PLUMS AND CHERRIES 3 AC.
FERTILIZER WHEAT AND OATS
FERTILIZER BARLEY
FERTILIZER ROOT PLOTS
S1-2·00 AC.
D1-2·00 AC
S2-2·00 AC.
D2-2·00 AC.
D3-2·00 AC.
S4-2·00 AC
D4-2·00 AC
APPLE ORCHARD 18 AC
FERTILIZER CORN PLOTS
E1-14·00 AC
A1-9·96 AC.
B1-10·00 AC.
M AND N 6·00 AC.
O AND P 6·00 AC.
A3-10·2 AC.
B3-10 20 AC.
E3-14 00 AC.


PLAN OF
CENTRAL EXPERIMENTAL FARM
OTTAWA.
CANADA.
FOREST BELT
HOGLANDS
H1-3·35 AC
H2-3·15 AC.
H3-2·85 AC.
3 27 AC
T4-3·50 AC
T1-1·51 AC
LABORATORY
OBSERVATORY
Z3-6·66 AC.
OBSERVATORY FIELD
EXPERIMENTAL PLOTS (NORTH FIELD)
ROUGH LANDS PASTURE
STONY FIELD
PARK
VEGETABLES & SMALL FRUITS 5 AC
SMALL FRUITS 1 AC
VG'T'BL'S TOBACCO 3 AC
POULTRY
GRASS PLOTS
HEDGES
LAWNS
EXPERIMENTAL PLOTS (EAST FIELD)
OFFICE
VINE YARD 2 AC.
ROOT HOUSE
BARNS
SHEEP
PIGS
PIGGERY
EXPERIMENTAL PLOTS
NURSERY
EXPERIMENTAL PLOTS (SOUTH FIELD)
ARBORETUM
65
C. P. RAILROAD
DOW'S LAKE
RIDEAU CANAL

The grain crop mentioned second is sown after the Timothy or mixed hay. The land is ploughed shallow in August, harrowed and cultivated at intervals till October 15 or later, then put up into ridges by means of a double mould board plough. The seed is sown after the ridges are broken down in the spring, and with the oats 10 pounds of Red Clover to the acre is sown.

Corn follows this grain crop. The clover is allowed to grow within a day or two of the date on which it is desired to sow the corn. Meanwhile manure will have been spread upon the field in the fall, put there in small heaps during the winter and spread as soon as the land was bare, or spread from the wagon as early as possible in the spring. The Clover growing up through it facilitates the ploughing, which is done with a shallow wide furrow. The land is thoroughly disked, harrowed and then seeded with corn in rows 42 inches apart. It receives all the cultivation necessary to insure the retention of moisture and the killing of weeds between the rows.

A 1, 9·96 acres in Windmill is a long narrow, slightly rolling field, sand and muck predominating, but ranging to loam in spots, and is all underdrained.

It has given fairly good crops of all kinds in the past, 1902 oats, 1903 hay.

A 2, 8·90 acres in Lonetree; long, narrow, slightly rolling; sand to heavy loam in spots, mostly underdrained; fairly good crops; 1902 corn, 1903 oats.

A 3, 10·20 acres in Ashlands; oblong, slightly sloping to east and south; sand, heavy loam, muck and hardpan, mostly underdrained; fairly good crops; particularly good hay yields; 1902 hay, 1903 hay and pasture.

A 4, 9·15 acres, West Pine Grove and Fenceless; slightly sloping in Pine Grove; rolling in Fenceless; sand, muck loam to clay; underdrained; fair crops; 1902 oats, 1903 corn.

A 5, 9·63 acres Fenceless; square, rolling, sand loam, muck and clay, mostly underdrained; rather poor crops in past, save in case of hay; 1902 hay, 1903 oats.

There was nothing remarkable in connection with the crops on this rotation this year save that in A 2 there was some Alfalfa Clover as well as Red and Alsike.

ROTATION 'B.'

This rotation of five years' duration includes Grain, Clover, Hay, Grain, Clover Hay and Corn in the order named.

The grain crop mentioned first comes after corn. The treatment of the corn stubble is the same as in the case of Rotation 'A.' With the Grain is sown 10 pounds Red Clover, 1 pound Alsike and 5 pounds Timothy seed per acre. The Clover field mentioned first is cut twice, if possible, then ploughed about the end of August, cultivated and harrowed at intervals and ridged up late in October.

The Grain crop mentioned second is sown on a field treated as just described, the ridges being broken down in the spring by means of the disc harrow, and 10 lbs. Red Clover, 1 lb. Alsike and 5 lbs. Timothy seed per acre. The Clover field mentioned first is cut twice, if possible, then ploughed about the end of August, cultivated and harrowed at intervals and ridged up late in October.

The Grain crop mentioned second is sown on a field treated as just described, the ridges being broken down in the spring by means of the disc harrow, and 10 lbs Red Clover, 1 lb. Alsike and 5 lbs. Timothy sown with the grain.

The Clover field mentioned second is cut twice if possible, and the aftermath or third crop allowed to stand all winter.

Corn follows the Clover crop just mentioned. The treatment is exactly the same as described for corn in Rotation 'A.'

B 1, 10·00 acres, Windmill; long narrow field, nearly level; sand, sandy loam and muck; all underdrained but somewhat springy; most crops fair, Timothy hay particularly good; 1902 oats, 1903 hay.

B 2, 8·82 acres, Lonetree; long, narrow, slightly rolling; sand to medium loam, some black muck; mostly underdrained; fairly good crops; 1902 corn, 1903 oats.

B 3, 10·20 acres, Ashlands; oblong slightly rolling sand to heavy sandy or light clay loam; mostly underdrained; fairly good crops in past; 1902 hay, 1903 hay and pasture.

B 4, 9·15 acres, West Pine Grove; square slightly sloping to north-west; sand, sandy loam, muck and clay underdrained; fair crops, some bad spots; 1902 oats, 1903 corn.

B 5, 9·93, Fenceless; square fairly flat loam. clayey loam and clay, mostly clay, well underdrained; rather poor crops in past save in hay; 1902 hay; 1903 grain.

The crops on the various fields in this rotation in 1904 were uniformly fair; in A 1, owing to a new spring appearing, nearly an acre of corn was lost; in B 5 part of the field had been in pease in 1903, so had to be sown down to oat hay in the spring, and the rest of the field had had no timothy sown with the clover in 1903, and had in addition been tramped by the cattle in the fall of 1903, as it was not known then that it would be in hay in 1904.

ROTATION

This rotation of five years duration is that which has been followed for the

Lot.	Location.	Description of Soil. Sand.	Sandy Loam.	Clayey Loam.	Clay.	Black Muck.	Gravel.	Hardpan.	Area in Acres.	Crop. 1903.	Crop. 1904.	Rent and Manure.	Seed, Twine and use of Machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.		1903.	1904.	$ cts.	$ cts.
A 1........	W.S. 3......	30	45	....	....	25	....	....	9·96	Hay..........	Hay......	59 76	11 35
A 2........	L.S. 1......	30	65	5	....	....	....	....	8·90	Oats...... ...	"	53 40	17 44
A 3........	A.S. 14.....	10	15	20	20	15	....	20	10·20	Pasture & hay.	Oats......	61 20	16 32
A 4......	W.P.G.S. 1. F.S. 1......	70	20	10	....	....	....	....	9·15	Corn.... . .	"	54 90	14 53
A 5........	F.S. 3 ...	....	35	30	10	15	10	....	9·63	Grain	Corn......	57 78	11 78
	Aggregate..........								47·84	....	... .	287 04	71 42
	Average per acre....								1	....	....	6 00	1 49

ROTATION

This rotation of five years duration is a modification

Lot.	Location.	Sand.	Sandy Loam.	Clayey Loam.	Clay.	Black Muck.	Gravel.	Hardpan.	Area in Acres.	Crop.	Crop.	Rent and Manure.	Seed, Twine and use of Machinery.
B 1........	W.S. 4.... .	5	35	5	50	5	....	....	10·00	Hay	Corn......	60 00	12 00
B 2	L.S. 2......	20	70	....	5	5	....	....	8·82	Oats.........	Hay......	52 92	17 29
B 3	A.S. 15.....	20	60	5	....	15	....	....	10·20	Hay & pasture.	Oats......	61 20	16 32
B 4	W.P.G.S. 2.	20	60	15	....	5	.. .	....	9·15	Corn..........	Grain	54 90	14 53
B 5........	F.S. 2....	....	30	30	40	....	....	....	9·93	Grain	Hay......	59 58	19 46
	Aggregate..................								48·10	....	....	288 60	79 60
	Average per acre............								1	....	....	6 00	1 66

ROTATION 'E.'

This rotation of three years duration includes grain, pasture and corn.

The grain comes after the corn, the stubble of which is treated as described under Rotation 'A.' With the grain in the spring is sown 10 lbs.red clover, 1 lb. alsike clover, 5 lbs. Alfalfa clover and 5 lbs. timothy seed per acre. If weather permits the field is pastured slightly in the fall.

After the grain crop the land is pastured, the grass seeding having been done with this object in view. In estimating the value of the returns from this field, pasture is charged at $1 per month per cow. At this rate the returns fall very far short of what would have been the returns if a hay crop had been harvested, if we may judge by the returns from 'Z 2.' This rotation and Rotation 'Z' were introduced into the list in order to gain some idea as to the difference in returns probable from land pastured and land from which all the crops are harvested. Of course, it is just possible that the corn crop after the pasture may in a measure make up for the difference in favour of the no pasture rotation 'Z.'

Corn follows the pasture. Manure is applied during the fall and winter and turned under with the growth of clover in the spring. The land is ploughed shallow

'A.'

last five years on the whole "200 acre farm." Area, 47·84 acres.

Items of Expense in Raising Crop of 1904.								Particulars of Crop of 1904.						
Manual Labour.		Horse Labour.												
No. of hours.	Cost of Manual Labour.	No. of hours with Team.	No. of hours with Single Horse.	Value of Horse Labour.	Threshing.	Total Cost.	Cost for 1 Acre.	Grain.	Straw.	Hay.	Roots and Ensilage.	Total Value.	Value of Crop per Acre.	Profit per Acre in 1904.
Hrs.	$ cts.	Hrs	Hrs	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
144	19 20	48	27	16 73	......	107 04	10 75	......	....	44,000	....	154 00	15 46	4 71
207	27 52	$50\frac{3}{5}$	$35\frac{3}{5}$	18 88	.....	117 24	13 17	.....	......	77,483	....	271 19	30 47	17 30
43	5 74	163	....	40 75	13 14	137 15	13 44	22,114	25,333	....	....	271 81	26 65	13 31
38	5 07	$118\frac{1}{5}$	...	29 55	7 94	112 09	12 24	13,236	20,711	....	....	172 76	18 54	6 30
452	60 25	278	26	74 05	... .	203 86	21 17	... .	......	....	279,060	279 06	28 98	7 81
884	117 78	$657\frac{4}{5}$	$88\frac{3}{5}$	179 96	. ..	677 38	14 37	35,350	46,044	121,483	279,060	1,154 82	24 33	9 96
18·48	2 46	$13\frac{3}{4}$	$1\frac{4}{5}$	3 76	.....	14 37	14 37	738	962	2,537	5,833	24 33	24 33	9 96

'B.'

of Rotation "A." Area, 48·10 acres.

470	62 65	292	28	77 90	.....	212 55	21 25	......	.....	....	216,755	216 75	21 67	0 42
205	27 33	$50\frac{1}{5}$	$35\frac{1}{5}$	18 71	......	116 25	13 18	.....	......	76,787	....	268 75	30 47	17 29
43	5 74	163	....	40 75	11 31	135 32	13 27	18,848	28,516	....	....	245 51	24 07	10 80
38	5 07	$118\frac{1}{5}$	....	29 55	7 94	112 09	12 24	13,722	22,118	....	....	181 45	19 83	7 59
202	26 94	48	43	19 52	....	125 50	12 64	......	.... .	63,430	....	222 00	22 35	9 71
958	127 73	$571\frac{2}{3}$	$66\frac{1}{2}$	186 43	....	701 71	14 59	32,570	50,634	140,217	216,755	1,134 41	23 58	8 99
19·9	2 65	13·9	1·38	3 87	......	14 59	14 59	677	1,052	2,914	4,506	23 58	23 58	8 99

and disc harrowed, the corn is then sown in rows 42 inches apart and receives the usual treatment during the rest of the season.

E 1, 14·00 acres, Windmill; rolling land, well drained; sand, sandy loam, small amount clayey loam; good crops; 1902, oats; 1903, hay.

E 2, 13·75, Lonetree; rolling land, well underdrained; sand, sandy loam, muck, small amount clay and clayey loam; good crops; 1902, corn; 1903, oats.

E 3, 14·00 acres, Morningside; rolling land, well drained; sand, sandy loam, small amount clayey loam; good crops; 1902, pasture; 1903, grain.

ROTATION 'Z.'

This rotation of 3 years' duration includes corn, grain and clover hay, in the order named.

Corn comes after the clover hay. The manure is applied in the fall or during the winter and spring and the clover allowed to grow up through it, so facilitating the turning of the whole mass of manure and spring growth and late fall growth of

ROTATION

This rotation of three years duration includes

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crop.	Crop.	Rent and manure.	Seed, twine and use of machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.	1903.	1904.	$ cts.	$ cts.
E 1.... ...	W.S. 1......	40	40	...	...	15	5	...	14·00	Hay	Corn.....	84 00	16 80
E 2.	L.S. 4......	10	60	10	...	20	....	....	13·75	Oats	Pasture ..	82 50	25 57
E 3........	Morn	30	60	5	....	5	....	....	14·00	Grain	Oats......	84 00	22 40
	Aggregate..........								41·75	....	....	250 50	64 77
	Average per acre..........								1·00	....	....	6 00	1 55

ROTATION

This rotation of three years duration

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crop. 1903.	Crop. 1904.	Rent and manure.	Seed, twine and use of machinery.
Z 1........	W.S. 2......	40	40	....	....	15	5	....	6·00	Hay	Corn	36 00	7 80
Z 2........	L.S. 3......	10	60	10	....	20	....	....	5·81	Oats...	Hay	34 86	11 38
Z 3...	Obs. S......	10	60	20	10	....	....	....	6·66	Hay	Oats......	40 00	10 65
	Aggregate..........								18·47	....	....	110 86	29 83
	Average per acre..........								1·00	... .	....	6 00	1 61

clover under a few days before the corn is to be sown. The furrow turned is quite shallow, about 5 inches deep, and the land is then thoroughly disc-harrowed and the corn sown in rows 42 inches apart. It receives later the usual cultivation and care.

Grain follows corn, the land having been prepared as described under Rotation 'A. With the grain there is sown 10 lbs. red clover, 1 lb. alsike and 5 lbs. Timothy seed.

The hay is cut twice and the last aftermath allowed to grow up to be turned under the next spring.

Z 1, 6·00 acres, Windmill; long narrow field; sand, muck, heavy loam underdrained; rolling land; crops usually good, 1902, oats; 1903, hay.

Z 2, 5·81 acres, Lonetree; long narrow field of rolling land, sand, muck, sandy loam; underdrained; fair crops; 1902, corn; 1903, oats.

Z 3, 6·66 acres, Observatory; irregular square; sand, sandy loam, clayey loam, clay; underdrained; good crops; 1902, hay; 1903, hay.

ROTATION 'H.'

This rotation is of three years duration and includes roots, soiling crop and pasture in the order named. The land is plowed late in the fall after it has been manured. It is disked the next spring and the roots sown on ridges. The roots receive the usual cultivation and are of a varied character, including mangels, sugar mangels,

'E.'

pasture and has an area 41·75 acres.

Items of Expense in Raising Crop of 1904.								Particulars of Crop of 1904.						
Manual Labour.		Horse Labour.												
No. of hours.	Cost of manual labour.	No. of hours with team.	No. of hours with single horse.	Value of horse labour.	Threshing.	Total cost.	Cost for 1 acre.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit per acre in 1904.
Hrs.	$ cts.	Hrs	Hrs	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
$658\frac{1}{4}$	87 54	$417\frac{3}{5}$	38	111 00	......	299 34	21 38	......	......	....	382,116	382 12	27 29	5 91
....	...	....	....	..	......	108 07	7 85	.. ...	......	*143	....	143 00	10 41	2 56
135	17 99	193	....	48 25	12 85	185 49	13 25	21,413	32,781	....	....	279 69	19 98	9 13
$793\frac{1}{4}$	105 53	$610\frac{2}{5}$	....	159 25	.....	592 90	......	21,413	32,781	143	382,116	592 90	....	... ...
19	2 53	146	....	3 82	......	14 20	14 20	512	785	3·42	9,152	19 28	19 28	5 08

* Hay not cut but field furnished pasturage equivalent to 1 cow on pasture for 143 mos.

'Z.'

includes an area of 18·47 acres.

282	37 60	179	$16\frac{1}{2}$	47 89	......	129 29	21 55	......	......	....	163,764	163 76	27 28	5 73
136	18 15	33	$23\frac{1}{5}$	12 11	......	76 50	13 17	......	.. ..	50,756	....	177 64	30 47	17 30
36	4 80	90	....	22 50	6 92	84 87	12 74	11,520	17,160	.... ..	....	161 93	24 32	11 58
454	60 55	202	$39\frac{2}{3}$	82 50	.....	290 66	15 73	11,520	17,160	50,756	163,764	503 33	27 25	......
24·57	3 27	16·35	2·14	4 46	......	15 73	15 73	623	929	2,748	8,866	27 25	27 25	11 52

sugar beets and turnips devoted to pork production for the most part, the surplus being sold to cattle and the returns invested in meal for pig feeding.

The soiling crop field is sown with various crops suitable for feeding to pigs. What is over and above the amount possible of consumption by pigs is sold to cattle at $2 per ton and the returns used to purchase meal for pork production.

The pasture area is divided into several parts, the seed being sown as far as possible at the same time as the soiling crops the previous year and not allowed to be eaten too close the first fall, although any good growth is not wasted.

H 1, 3·35 acres, Hoglands; rolling, sand and sandy loam; underdrained; 1902, pasture; 1903, oats.

H 2, 3·15 acres, Hoglands; rolling, sand, hardpan, loam, clayey loam; underdrained; 1902, pasture; 1903, grain.

H 3, 2·85 acres, Hoglands; sloping north; clayey loam, clay, sandy loam, sand; underdrained; 1902, pasture; 1903, rape and hog pasture.

'Sheep Farm.'

This rotation of four years duration includes roots, grain, hay, pasture.

The area devoted to sheep farming is rather limited, about 10·72 acres. This area is not included in the '200 acre farm.' The whole field had been for several years

ROTATION

This rotation of three years duration includes an area of 9·35 acres.

Lot.	Location.	Description of Soil.							Area in Acres.	Crop.	Crop.	Rent and Manure.	Seed, Twine and use of Machinery.
		Sand.	Sandy Loam.	Clayey Loam.	Clay.	Black Muck.	Gravel.	Hardpan.					
		p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	Ac.	1903.	1904.	$ cts.	$ cts.
H 1........	H.S. 1......	30	40	20	10	....	....	....	3·35	Grain........	Pasture and hay.	20 10	5 35
H 2........	H.S. 2......	25	45	20	10	..	....	....	3·15	"	Roots	18 90	3 69
H 3...	H.S. 3......	10	20	50	20	...	....	....	2·85	Rape and pasture.	Pasture and soiling crop.	17 10	3 65
	Aggregate............................								9·35			56 10	12 69
	Average per acre..........................								1			6 00	....

ROTATION

This rotation of four years duration is devoted to

Lot.	Location.	Description of Soil.							Area in Acres.	Crop.	Crop.	Rent and Manure.	Seed, Twine and use of Machinery.
		Sand.	Sandy Loam.	Clayey Loam.	Clay.	Black Muck.	Gravel.	Hardpan.					
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.	1903.	1904.	$ cts.	$ cts.
T 1..	S.S. 1......	10	90	....	....	....	....	....	1·51	Pasture......	Roots and soiling.	9 06	3 90
T 2........	S.S. 2......	15	85	....	....	...	....	....	2·44	Rape, pastured	Rape, p'std	14 64	2 43
T 3.	S.S. 3.....	....	100	....	....	....	....	....	3·27	Pasture.	Soiling....	19 62	6 98
T 4.......	S.S. 4......	15	85	....	....	....	....	....	3·50	"	Pasture...	21 00	6 00
	Aggregate..................................								10·72			64 32	19 31
	Average per acre..........								......			6 00	1 80

devoted to pasturing sheep, but it has been divided into four rather unequal fields susceptible of further subdivision and devoted to a rotation considered suitable for sheep.

'H.'

It is as far as possible devoted to pork production.

Items of Expense in Raising Crop of 1904.								Particulars of Crop of 1904.						Profit per Acre in 1904.
Manual Labour.		Horse Labour.												
No. of Hours.	Cost of Manual Labour.	No. of hours with Team.	No. of hours with single Horse.	Value of Horse Labour.	Threshing.	Total Cost.	Cost for one Acre.	Grain.	Pasture for Pigs.	Hay.	Roots and Green Feed.	Total Value.	Value of Crop per Acre.	
	$ cts.	Hrs	Hrs	$ cts.	$	$ cts.	$ cts.	Lbs.	Mos.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
2	0 27	5	2	1 60	.....	27 32	8 15	.....	63	3,580	14,570	38 70	11 55	3 40
493	65 61	32	28	12 90	.....	101 10	32 10	.....	.....	....	132,570	132 57	42 09	9 99
......	.....	23½	....	5 87	.....	26 62	9 34	.....	10	....	42,735	44 73	15 69	6 35
495	65 88	60½	30	20 37	.....	155 04	......	.....	.....	3,580	189,875	216 00	23 10	6 52
......	......	....	....	....	.....	16 58	16 58	....	7·80	382	20,307	23 10	23 10	6 52

'T.'

Sheep, it includes an area of 10·72 acres.

Items of Expense in Raising Crop of 1904.								Particulars of Crop of 1904.						Profit per Acre in 1904.
Manual Labour.		Horse Labour.												
No. of Hours.	Cost of Manual Labour.	No. of hours with Team.	No. of hours with single Horse.	Value of Horse Labour.	Threshing.	Total Cost.	Cost for one Acre.	Grain.	Sheep on Pasture.	Hay.	Roots, Ensilage and Soiling Crop.	Total Value.	Value of Crop per Acre.	
	$ cts.	Hrs	Hrs	$ cts.	$	$ cts.	$ cts.	Lbs.	Mos.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
100	13 33	13½	....	3 37	......	29 66	19 64	....	......	....	30,684	30 68	20 32	0 68
2	0 27	16	....	4 00	......	21 34	8 75	....	87·1	....	....	17 42	7 14	*1 61
......	....	34	....	8 50	......	35 10	10 73	......	73·5	....	40,315	55 02	16 82	6 12
......	....	...	...	...	......	27 00	7 71	....	143·6	....	....	28 72	8 21	0 50
102	13 60	63½	....	15 87	......	113 10	.....	.....	304·2	....	70,999	131 84	12 30	1 75
9½	1 27	6	....	1 48	.....	10 55	10 55	.....	28·22	....	6,623	12 29	12 30	1 75

* Loss.

The root field is devoted to white turnips, Swedes, cabbage, Kohl Rabi, thousand headed kale, rape, &c. It comes after the pasture, the land being manured and plowed in the fall.

ROTATION

Four year rotation, with Deep

Lot.	Location.	Description of Soil. Sand.	Sandy Loam.	Clayey Loam.	Clay.	Black Muck.	Gravel.	Hardpan.	Area in Acres.	Crop.	Crop.	Rent and Manure.	Seed, Twine and use of Machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.		1903.	1904.	$ cts.	$ cts.
D 1........	E.P.G.S. 2..	20	80	....	....	....	....	....	2	Corn......	Oats......	12 00	3 20
D 2........	" 4..	20	80	....	....	....	....	....	2	"	Oat hay...	12 00	2 60
D 3........	" 6..	30	70	....	....	....	....	....	2	"	" ..	12 00	2 60
D 4........	" 8..	60	40	....	....	....	....	....	2	Roots	Roots	12 00	2 35
	Aggregate........								8	....	....	48 00	10 75
	Average per Acre........								1	....	....	6 00	1 34

ROTATION

Four year rotation, with Shallow

S 1........	E.P.G.S. 1..	20	80	....	....	....	....	....	......	Corn..........	Oats......	12 00	3 20
S 2........	" 3..	20	80	....	....	....	....	....	......	"	Oat hay..	12 00	2 60
S 3........	" 5..	30	70	....	....	....	....	....	......	"	" ..	12 00	2 60
S 4........	" 7..	60	40	....	....	....	....	....	......	"	Roots	12 00	2 35
	Aggregate........								....	....	....	48 00	10 75
	Average per Acre........								...	....	....	6 00	1 34

Grain follows the root land, and with the grain various clovers and grass seeds are sown to prepare for the ensuing two years. The grain may be harvested or used as soiling crop for sheep.

The hay field is expected to give one crop of hay and then be devoted to pasture for lambs as soon as they are weaned.

The pasture field is the field that has been hay the previous year. Alfalfa, Red clover, Alsike clover, Bromus inermis and Timothy are the clovers and grasses used.

T 1, 1·51 acres, Sheeplands; fairly level, quite stony, light loam; always in pasture till 1904.

T 2, 2·44 acres, Sheeplands; quite level loamy; 1902, grain; 1903, rape.

T 3, 3·27 acres, Sheeplands; rolling, very stony shallow light loam soil; always in pasture till 1904.

T 4, 3·50 acres, Sheeplands; slightly rolling sand, sandy loam; 1902, hay; 1903, pasture.

ROTATION 'D.'

Deep Ploughing.

This rotation is of four years' duration and includes grain, clover hay, mixed clover and timothy hay and roots.

'D.'

late Fall Plowing Area 8 acres.

Items of Expense in Raising Crop of 1904.								Particulars of Crop of 1904.						
Manual Labour.		Horse Labour.												
No. of Hours.	Cost of Manual Labour.	No. of hours with Team.	No. of hours with single Horse.	Value of Horse Labour.	Threshing.	Total Cost.	Cost for 1 Acre.	Grain.	Straw.	Hay.	Roots and Ensilage.	Total Value.	Value of Crop per Acre.	Profit per Acre in 1904.
Hrs.	$ cts.	Hrs	Hrs	$ ts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
20	2 67	$23\frac{2}{5}$	....	5 85	1 15	24 87	12 43	1,916	5,344	....	....	29 85	14 92	2 48
57	7 60	$25\frac{2}{5}$	13	8 63	......	30 83	15 41	......	......	9,553	....	33 37	16 68	1 27
57	7 60	$25\frac{2}{5}$	13	8 63	......	30 83	15 41	......	......	9,553	....	33 37	16 68	1 27
$323\frac{2}{3}$	43 15	$44\frac{1}{2}$	23	15 15	......	72 65	36 32	......	......	....	87,245	87 25	43 62	7 30
$457\frac{2}{3}$	61 02	$118\frac{2}{3}$	49	38 26	......	159 18	....	1,916	5,344	19,106	87,245	183 84	22 98	3 09
$57\frac{1}{5}$	7 63	$14\frac{3}{4}$	$6\frac{1}{8}$	4 78	.....	19 89	19 89	239·5	668	2,388	10,905	22 98	22 98	3 09

'S.'

early Fall Plowing Area 8 acres.

20	2 67	$23\frac{2}{5}$	....	5 85	1 15	24 87	12 43	1,916	5,344	....	....	29 85	14 92	2 48
57	7 60	$25\frac{2}{5}$	13	8 63	.....	30 83	15 $41\frac{1}{2}$	....	.....	9,533	....	33 37	16 68	1 27
57	7 60	$25\frac{2}{5}$	13	8 63	......	30 83	15 $41\frac{1}{2}$	....	....	9,533	....	33 37	16 68	1 27
$323\frac{2}{3}$	43 15	$44\frac{1}{2}$	23	15 15	......	72 65	36 32	....	....	....	87,245	87 25	43 62	7 30
$457\frac{2}{3}$	61 02	$118\frac{2}{3}$	49	38 26	.....	159 18	.....	.....	.....	19,066	87,245	183 84	22 98	3 09
$57\frac{1}{5}$	7 63	$14\frac{3}{4}$	$6\frac{1}{8}$	4 78	......	19 89	19 89	239·5	668	2,383	10,905	22 98	22 98	3 09

The grain crop is sown after roots. Afer the roots are harvested the land is ploughed $5\frac{1}{2}$ inches deep, and then left till the next spring, when it is harrowed and seeded to oats. With the grain is sown 10 pounds Red clover, 1 pound Alsike clover and 10 pounds Timothy seed per acre.

The clover hay is cut twice in the season, and the second aftermath left on the field, *i.e.*, it is not pastured off.

The mixed clover and timothy hay is cut twice if possible and plowed 7 inches deep early in October. Manure is applied and the land replowed in the spring with a shallower furrow.

The roots are sown on ridges drilled up after the spring ploughing, and receive the usual cultivation.

D 1, 2 acres, East Pine Grove; slopes to north-west, is partly underdrained; sand to rather heavy sandy loam; has given fair crops for most part, but has small 'bad land' spots; 1902, oats; 1903, corn.

D 2, 2 acres, East Pine Grove; slopes from both ends to centre; underdrained; sand to heavy loam; has given good crops for most part, but has some 'bad land' spots; 1902, oats; 1903, corn.

D 3, 2 acres, East Pine Grove; slopes from both ends to centre; underdrained; sand to sandy loam, underdrained; good crops; 1902, oats; 1903, corn.

ROTATION

This rotation of six years

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crop. 1903.	Crop. 1904.	Rent and manure.	Seed, twine and use of machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.			$ cts.	$ cts.
M 1........	A.S. 2	....	30	15	....	45	....	10	1	Meadow and pasture.	Oats......	6 00	1 60
M 2.......	A.S. 4......	....	30	15	....	45	....	10	1	" ..	Oat hay ..	6 00	1 30
M 3.......	A.S. 6......	....	30	15	....	45	....	10	1	" ..	" ..	6 00	1 30
	Aggregate..								3	....	....	18 00	4 20
	Average per acre....								1	... .	....	6 00	1 40

ROTATION

This rotation of six years duration includes no clover save such

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crop. 1903.	Crop. 1904.	Rent and manure.	Seed, twine and use of machinery.
N 1	A.S. 3......	....	30	15	.. .	45	....	10	1	Meadow and pasture.	Oats.....	6 00	1 60
N 2	A.S. 5......	....	30	15	....	45	....	10	1	" ..	Oat hay ..	6 00	1 30
N 3	A.S. 7......	....	30	15	....	45	....	10	1	" ..	" ..	6 00	1 30
	Aggregate....								3	....	....	18 00	4 20
	Average per acre....								1	....	....	6 00	1 40

D 4, 2 acres, East Pine Grove; slopes to south-east; sandy loam; partly under-drained; good crops; 1902, oats; 1903, roots.

ROTATION 'S.'

Shallow Ploughing.

This rotation is of 4 years' duration, and includes grain, clover hay, mixed clover and timothy hay and roots.

The grain crop is sown after roots. After the roots are harvested in the fall, the land is ploughed shallow, 4 inches deep, and then left till the next spring, when it is harrowed and seeded to oats. With the grain is sown 10 pounds red clover, 1 pound alsike clover and 10 pounds timothy seed per acre.

The clover hay is cut twice in the season and the second aftermath left on the field; that is, it is not pastured off, as is usually done.

The mixed clover and timothy hay is cut twice if possible, and in August the land ploughed with a shallow furrow (exactly 4 inches deep). The land is kept cultivated and harrowed at intervals till late October, when it is ridged up with the double mould board plough. To this field destined for roots, manure is applied during the winter,

'M.'

duration includes the clover hay. Area 3 acres.

Items of Expense in raising Crop of 1904.								Particulars of Crop of 1904.						
Manual Labour.		Horse Labour.												
No. of hours.	Cost of manual labour.	No. of hours with team.	No. of hours with single horse.	Value of horse labour.	Threshing.	Total cost.	Cost for 1 acre.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit per acre in 1904.
Hrs.	$ cts.	Hrs	Hrs	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
4	0 53	16	....	4 00	0 90	13 04	13 04	1,493	3,182	....	....	21 29	21 29	8 25
15	2 00	16½	....	4 12½	....	13 60	13 60	......	......	3,670	....	12 85	12 85	*0 75
15	2 00	16½	....	4 12½	.....	13 60	13 60	.. ..	......	3,670	....	12 85	12 85	*0 75
34	4 53	49	....	12 25	......	40 24	13 41	1,493	3,182	7,340	......	46 99	15 66	2 25
11⅓	1 51	16⅓	...	4 08	....	13 41	13 41	498	1,061	2,447	... ...	15 66	15 66	2 25

* Loss.

'N.'

as may happen to get into the field from unknown sources. Area 3 acres.

4	0 53	16	....	4 00	0 90	13 04	13 04	1,493	3,182	....	....	21 29	21 29	8 25
15	2 00	16½	....	4 12½	.. ...	13 60	13 60	......	......	3,670	....	12 85	12 85	*0 75
15	2 00	16½	....	4 12½	......	13 60	13 60	.....	.....	3,670	....	12 85	12 85	*0 75
34	4 53	49	. ..	12 25	0 90	40 24	13 41	1,493	3,182	7,340	....	46 99	15 66	2 25
11⅓	1 51	16⅓	....	4 08	0 30	13 41	13 41	498	1,061	2,447	....	15 66	15 66	2 25

* Loss.

disked in the spring and the land again ridged up and sown to roots, which receive the usual cultivation.

S 1, 2 acres, East Pine Grove; slopes to north-west; is partly underdrained; sand to rather heavy sandy loam; has given fair crops for most part, but has small 'bad land' area; 1902, oats; 1903, corn.

S 2, 2 acres, East Pine Grove; slopes from both ends to centre; sand to heavy loam; underdrained for most part; has given good crops for most part but has some 'bad land' spots; 1902, oats; 1903, corn.

S 3, 2 acres, East Pine Grove; slopes from both ends to centre, underdrained; sand to sandy loam; underdrained; good crops; 1902, oats; 1903, corn.

S 4, 2 acres, East Pine Grove; slopes to south-east; sandy loam; partly underdrained; good crops; 1902, oats; 1903, corn.

ROTATION 'M.'

This rotation of six years duration includes in its crops grain, grain, clover hay and then Timothy hay or mixed hay for three years.

The first year, grain is sown on sod plowed late in the fall. In the spring the land is disked, harrowed and sown with 10 pounds of red clover seed per acre at the same

ROTATION

This rotation of three years duration has no

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crop.	Crop.	Rent and manure.	Seed, twine and use of machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.	1903.	1904.	$ cts.	$ cts.
O 1	A. S. 8.	....	30	15	....	45	....	10	1	Meadow and pasture.	Oat hay ..	6 00	1 30
O 2	A. S. 10	....	30	15	....	45	....	10	1	"	" ..	6 00	1 30
O 3	A. S. 12 ...	....	30	15	....	45	....	10	1	"	Oats	6 00	1 60
	Aggregate								3	....	....	18 00	4 20
	Average per acre								1	....	....	6 00	1 40

ROTATION

This rotation of three years duration

P 1	A. S. 9	....	30	15	....	45	....	10	1	Meadow and pasture.	Oat hay ..	6 00	1 30
P 2	A. S. 11	....	30	15	....	45	....	10	1	"	" ..	6 00	1 30
P 3	A. S. 13	....	30	15	....	45	....	10	1	"	Oats	6 00	1 60
	Aggregate								3	....	....	18 00	4 20
	Average per acre								1	....	....	6 00	1 40

time as the grain is sown. After the grain is harvested the clover is allowed to grow as late as possible and the land plowed the last thing in the fall. The next spring 8 pounds of Red clover and 10 pounds Timothy seed is sown with the grain and the land put in as good shape as possible.

Clover hay follows the second year grain. It is cut twice in the year and the last aftermath not pastured.

Timothy hay or mixed hay then occupies the land for three consecutive years. Manure is applied in the fall of the second year that the field is under hay.

M 1, 1 acre, Ashlands; long narrow field, sandy loam, clayey loam, black muck, hardpan; underdrained; good crops; 1902, hay; 1903, hay and pasture.

M 2, and M 3, are quite similar to M 1 in every respect.

The crops of hay on M 2 and M 3 this year should not be taken as a fair sample of what may be expected from these fields in the future as it was impossible to have them under the right kind of hay the first year and so they were put under oat hay.

ROTATION 'N.'

This rotation of six years duration includes in its crops grain, grain and Timothy hay for four years.

The first years grain is sown on land that had been plowed six inches deep the fall previous. No grass or clover seed of any kind is sown with it. The stubble is plowed

'O.'

clover included in its crops. Area 3 acres.

Items of Expense in Raising Crop of 1904.								Particulars of Crop of 1904.						
Manual Labour.		Horse Labour.												
No. of hours.	Cost of manual labour.	No. of hours with team.	No. of hours with single horse.	Value of horse labour.	Threshing.	Total cost.	Cost for 1 acre.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit per acre in 1904.
Hrs.	$ cts.	Hrs	Hrs	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
15	2 00	16½	....	4 12½	......	13 60	13 60	.....	......	3,670	....	12 85	12 85	*0 75
15	2 00	16½	...	4 12½	.....	13 60	13 60	......	.....	3,670	....	12 85	12 85	*0 75
4	0 53	16	....	4 00	1 30	13 43	13 43	2,169	2,482	....	....	26 65	26 65	13 22
34	4 53	49	...	12 25	1 30	40 63	13 54	2,169	2,482	7,340	....	52 35	17 45	3 91
11⅓	1 51	16⅓	....	4 08	0 43	13 54	13 54	723	827	2,447	....	17 45	17 45	3 91

* Loss.

'P.'

includes clover. Area 3 acres.

15	2 00	16½	....	4 12½	.....	13 60	13 60	......	......	3,670	....	12 85	12 85	* 0 75
15	2 00	16½	...	4 12½	.....	13 60	13 60	.....	.....	3,670	....	12 85	12 85	* 0 75
4	0 53	16	....	4 00	1 30	13 43	13 43	2,169	2,482	....	....	26 65	26 65	13 22
34	4 53	49	....	12 25	1 30	40 63	13 54	2,169	2,482	7,340	....	52 35	17 45	3 91
11⅓	1 51	16⅓	·43	4 08	0 43	13 54	13 54	723	827	2,447	....	17 45	17 45	3 91

*Loss.

in the fall and with the grain of the second year Timothy seed is sown at the rate of 12 pounds per acre. Every care is taken to insure a good catch and the land put in as good shape as possible to remain in meadow four years.

Timothy hay is then the crop for four years, manure being applied in the fall of the second year of hay.

N 1, 1 acre, Ashlands; long narrow field, sandy loam, clayey loam, black muck, hardpan; well underdrained; good crops; 1902, hay; 1903, hay and pasture.

N 2, and N 3 are quite similar to N 1 in every particular.

ROTATION 'O.'

This rotation is of three years duration and includes grain, timothy hay, timothy hay.

The field intended for grain is ploughed early in the fall and cultivated at intervals to insure the sod rottening. It is ploughed again late in the fall and with the grain, the next spring, timothy seed is sown at the rate of 12 lbs. to the acre.

Timothy hay is cut for two years and the land again ploughed early in the fall. Manure is applied in the fall of the first year under hay.

It was impossible to get the proper fields under timothy hay for this year, so it was necessary to sow oat hay. The results were not very satisfactory, so this year's

crop on O 1 and O 2 need not be taken as an example of what may be expected from these fields in the future.

O 1, 1 acre, Ashlands, long narrow field, rolling, sandy loam, clayey loam, black muck, hardpan; underdrained, good crops; 1902, hay; 1903, hay and pasture.

O 2, and O 3 are similar to O 1 in every particular.

ROTATION 'P.'

This rotation is of three years duration and includes grain, clover hay, and timothy hay or mixed hay.

The field intended for grain is ploughed early the previous fall and cultivated at intervals to insure the sod rotting. It is again ploughed late in the fall and left till seed time the next spring. With the grain is sown ten pounds clover and ten pounds timothy.

Manure is applied in the fall of the first year hay.

P 1, 1 acre, Ashlands; long narrow rolling sandy loam, clayey loam, black muck, hardpan; underdrained; good crops; 1902, hay; 1903, hay and pasture.

EXPERIMENTS WITH GRASSES AND CLOVERS FOR HAY.

Some further experiments to gain some information as to the comparative economy of different mixtures of grasses and clovers have been carried on during the year.

In comparison with the usual grass mixture of eight pounds timothy and ten pounds red clover, there were tested several others not so commonly used. Bromus inermis, orchard grass, alfalfa and alsike were the other grasses and clovers used. The following table gives full particulars of the different plots tested.

Particulars of seeding and returns in hay are as follows:—

—	Seed sown per acre. Grasses.	Lbs.	Clovers.	Lbs.	Yield of Hay July 5.	Yield of Hay Aug. 18.	Total yield Hay per lot.	Total yield Hay per acre.	Yield Green Feed Oct. 7.
					Tons. lbs.	Tons. lbs.	Tons. lbs.	Tons. lbs.	Tons. lbs.
Plot 1, 3½ acres	Timothy	10	Common Red	8	11 1,220	4 760	15 1,980	4 1,137	....
Plot 2, 5 acres	Timothy	4	....		16 42	6 520	22 560	4 912	7 330 put in silo
	Bromus Inermis	8	Alfalfa	8					
	Orchard grass	8	Common Red	6					
Plot 3, 5 acres	Timothy	4	Alsike	2	18 1,267	5 1,970	24 1,337	4 1,867	....
	Bromus Inermis	8	Common Red	6					
	Orchard	8	Alfalfa	2					
Plot 4, 5 acres	Timothy	5	Alsike	2	12 1,072	6 1,690	19 762	3 1,752	....
	Orchard	16	Common Red	6					
Plot 5, 5 acres	Timothy	5	Alsike	2	13 192	7 190	20 382	4 76	....
	Bromus Inermis	15	Common Red	6					
Total	....	91		48	71 1,793	30 1,130	102 1,021	4 943	7 330

Very little need be said in explanation or amplification of the above.

The early part of the season was very suitable for hay, and the first cut was most excellent in quality and large in quantity.

July and August were dry months in the Ottawa district, and consequently the second cut was quite light.

Plot 2, the seed on which included 8 pounds Alfalfa, was cut a third time, October 7, and the material (about 78 per cent Alfalfa) put in the experimental silo.

PASTURE.

None of these particular plots was pastured in 1904. A plot of 13·75 acres seeded with 10 pounds Timothy and 8 pounds Common Red clover was under pasture. This plot had been seeded down with oats the previous year. It made a very rapid growth in the spring, and the cattle were turned in May 20.

During the season 4,290 days' pasture was furnished by the 13·75 acres. This amount of pasture at $1 per month per head would be worth $143, or $10.41 per acre.

A field of 5·81 acres of similar seeding yielded during the season 25 tons, 763 pounds hay worth at $7 per ton $177.67. It will, however, be remembered that to harvest the hay cost considerable, about $1.66 per ton.

YIELDS AND COST OF VARIOUS CLASSES OF HAY.

In the following statement of cost of producing 1 ton and 1 acre of various sorts of hay and hay mixtures, labour, seed, rent and manure are all considered. Where more than one crop was harvested in the year the seed rent and manure were, of course, counted only once.

Kind of Hay.	Amount seed.	Cost per Acre to grow.	Cost per Ton to produce.	Yield per Acre.	Value of Hay per Ton.	Remarks.
		$ cts.	$ cts.	Tons. lbs.	$ cts.	
Timothy	10	10 75	4 87	2 400	8 00	
Timothy R. Clover	10 8	13 17	2 90	4 1,137	7 00	
Alfalfa Timothy Brome	8 4 8	13 90	3 10	4 912	7 00	A further aftermath cut for silage not considered in this estimate.
Timothy Alsike	8 6	13 77	2 82	4 1,800	7 00	
Oat hay	68	13 60	7 40	1 1,670	7 00	
Oat and Pea hay " "	50 30	15 41	6 46	2 766	7 00	

TIMOTHY.

Timothy is of course the favourite hay for horses. It is, however, usually expensive to produce since it yields only one crop in the season, and two tons is considered a very good yield per acre Freedom from dust, good keeping qualities, palatabilty and wholesomeness are its chief recommendations. It depletes the soil of fertility to a certain extent and very few fields should be left longer than two years under this crop.

TIMOTHY AND CLOVER.

Timothy and Red Clover mixed is a hay that, if well made, can scarcely be surpassed for any class of live stock, combining as it does in itself, palatability, wholesomeness, high digestibility, and high nutritive qualities. It is better for horses than

pure Timothy, and should be fed much more extensively than is at present the case in this country, provided, of course, that it is well made.

The Red Clover part of the mixture adds to the fertility of the soil and makes up in some measure for the loss entailed by the growing of the Timothy along with it.

ALFALFA.

Alfalfa, Timothy and Brome makes a most excellent hay for cattle of all descriptions and horses do very well on it. The Alfalfa part of the mixture increases the nitrogen content of the soil, but the other two constituents of the mixture are soil robbers.

TIMOTHY AND ALSIKE.

Timothy and Alsike is a hay of a very high value for cattle, but not so good for horses. Timothy is, of course, again a factor in lowering the fertility of the soil, but the Alsike being a perennial clover may be expected to replace at least a portion of the nitrogen removed.

OAT HAY.

Oat hay is not a hay that can be recommended to the farmers of this country, as it is expensive, only fairly palatable and not highly nutritious. To give the best results it must be cut the very day it is in the thin milk stage. Any later date means a great loss in palatability.

OAT AND PEA HAY.

Oats and pease make a very good hay mixture, but not equal to any of the other hays discussed, save only pure oat hay, which it surpasses for cattle and sheep and at least equals for horses.

MIXED CROP EXPERIMENT.

On West Pine Grove field, which had been under corn in 1903, were grown in 1904, in lots of 1 acre each, 7 different sorts of grain or grain mixtures. The aim was to determine if possible the comparative economy of sowing each sort of grain by itself or mixed with one or more other sorts. This experiment has been carried on for five years now and as the seasons have been quite varied and the soils used have been of different character each year, it may safely be considered as having been a fair test.

The results this year are as follows :—

	Grain, lbs. per acre.
Plot 1, pure pease, yielded	1,135
Plot 2, pure barley, yielded	1,662
Plot 3, pure oats, yielded	1,687
Plot 4, mixture, pease 1 bushel, barley 1 bushel, oats 1 bushel, yielded	1,550
Plot 5, mixture, pease 1 bushel, oats 2 bushels, yielded	1,447
Plot 6, mixture, oats 1½ bushels, barley 1 bushel, yielded	1,689
Plot 7, mixture, wheat ½ bushel, barley ¾ bushel, oats 1 bushel, and pease ¾ bushel yielded	1,498

A summary of the results for the five years is herewith submitted :—

—	Pounds of Grain per Acre.					
	1900.	1901.	1902.	1903.	1904.	Five year average per acre.
						Lbs.
Plot 1, pure pease, yielded	1,101	1,140	1,805	1,140	1,135	1,264
Plot 2, pure barley, yielded	1,252	1,070	2,490	1,070	1,662	1,507
Plot 3, pure oats, yielded	2,059	1,819	2,495	1,819	1,687	1,976
Plot 4, mixture, barley 1 bushel, oats 1 bushel, pease 1 bushel, yielded	1,559	....	2,183	....	1,550	1,764
Plot 5, mixture, pease 1 bushel, oats 2 bushels, yielded	1,247	746	2,382	....	1,447	1,455
Plot 6, mixture, oats $1\frac{1}{2}$ bushels, barley 1 bushel, yielded	1,458	1,239	2,360	1,238	1,689	1,597
Plot 7, mixture, wheat $\frac{1}{2}$ bushel, barley $\frac{3}{4}$ bushel, oats 1 bushel, pease $\frac{3}{4}$ bushel, yielded	1,560	888	2,225	888	1,498	1,412
Plot 8, mixture, oats and pease equal parts by weight, yielded	1,341	1,052	2,160	1,052	....	1,401
Plot 9, mixture, oats and pease equal parts by measure, yielded	....	1,011	2,165	1,011	....	1,396

The results seem to indicate that, generally speaking, pure grains may be expected to give more pounds to the acre than mixtures.

CORN.

Owing to difficulty in procuring seed of fair germinable quality, it was necessary to sow considerably more large growing late varieties than was desired. Several mixtures were sown, and herewith are submitted a few notes on the pure lots as well as on the mixed lots. Judging by the stand and the weights secured from some small lots cut before the frost of September 23, the yields from the different lots would have been from three to five tons per acre greater than was the actual yield when cut about the end of September and the first week in October.

LEAMING.

Leaming, 14 7/12 acres sown in drills 42 inches apart on June 1, cut for ensilage September 30. It yielded at the rate of 14 tons 610 lbs. per acre. The stand was very good, but frost coming on September 23 and 24 did a great deal of harm. The corn stood from 8 to 11 feet high and was fairly well cobbed.

LONGFELLOW AND RED COB ENSILAGE.

Longfellow and Red Cob Ensilage, $3\frac{1}{4}$ acres, sown June 8, cut for ensilage, October 6. Growth strong and fairly even, well cobbed in late milk at date of cutting. It stood from 8 to 10 feet high. It was badly frozen, but yielded 11 tons 1,968 lbs. per acre. The two made a very good mixture, which would have made excellent ensilage under favourable conditions.

SOUTHERN MAMMOTH SWEET AND EARLY BUTLER.

Southern Mammoth Sweet and Early Butler, 7 acres, sown June 6, cut for ensilage September 28. It made a strong even growth, but showed very few cobs on either

sort. It got past the late milk stage before being cut, but suffered very severely from the frost. It stood 7 to 9 feet high, and yielded at the rate of 12 tons 30 lbs. per acre.

CUBAN GIANT AND KING OF THE EARLIEST.

Cuban Giant and King of the Earliest, 6 7/12 acres, sown June 8, cut for ensilage October 5. This mixture made a strong, even growth, and was fairly well cobbed in the milk stage at time of cutting. It stood about 9 feet high, was very badly frozen, but yielded 92 tons 995 pounds, or 14 tons 353 pounds per acre. In a good season for corn this mixture would be a most profitable one to sow, particularly so on early or light soil.

NORTH DAKOTA AND RED COB ENSILAGE.

North Dakota and Red Cob Ensilage, 8 7-12 acres, sown June 7, cut for ensilage September 29. Rather uneven in growth, due to character of soil. Few cobs on North Dakota, none on Red Cob. Grew 8 to 10 feet high, and yielded 96 tons 1,355 pounds, or at the rate of 11 tons 527 pounds per acre. This mixture to be a success must have a fairly long season.

A summary of the cost of growing the whole 40 acres is submitted herewith. For particulars of soil preparation, methods of manuring, &c., the reader is referred to the paragraphs discussing the different rotations.

Cost of growing and returns from 40 acres of corn:—

Rent of land at $3 per acre	$120 00
Manure at $3 per acre (same allowance made for all crops).	120 00
Ploughing, 25·2 days at $2.50 per day	63 00
Disc harrowing, 12·6 days at $2.50 per day	31 50
Harrowing, 4 days at $2.50	10 00
Seeding, 4 days at $2.50	10 00
Seed, 20 bushels at $1.20 per bushel	24 00
Hoeing, 80 days at $1.33⅓ per day	106 66
Cultivating, team 32 days at $2.50 per day	80 00
Cultivating, single horse 11·2 days at $1.75 per day	19 60
Cutting with corn harvester, 11·4 days	28 50
Loading, unloading, tramping and putting into silo, 80 days at $1.33⅓ per day	106 66
Drawing with teams, 30·4 days at $2.50 per day	76 00
Twine, 2½ pounds per acre	12 00
Use of machinery at 30 cents per acre	12 00
Use of engine, &c., 6 days at $5	30 00
	$849 92

Forty acres yielded 520 tons 1,690 lbs.
Average yield per acre, 13 tons 42 lbs.
To produce 1 ton ensilage in silo cost $1.63.
Cost to produce 1 acre corn in silo ready to feed, $21.25.

EXPERIMENTAL SILO.

Some years ago a small silo was constructed, to be used for the purpose of experimenting with various crops as material for preservation as ensilage.

Different green crops have been tested from time to time, since its construction, as to their fitness for ensilage manufacture, and reported upon in previous reports.

In September, 1903, the silo was again filled with the following materials and mixtures, beginning at the bottom:—

		Lbs.
1.	Pure corn, late milk stage	9,370
2.	Corn, late milk stage	5,280
	Rape cut when about 15 inches high, mixed while going through blower or cut box	5,280
3.	Pure corn, late milk stage	960
4.	Pure rape, cut when about 15 inches high	5,620
5.	Corn, late milk stage	12,370
	Sunflower heads, mixed going through machine	2,120
6.	Horse beans	1,002
	Total weight put in silo	42,002

The silo was emptied in March, 1904, with the following results:—

1. Pure corn, late milk stage (bottom layer), weighed out on March 29, gave an excellent sample of ensilage palatable and sweet. All classes of stock seemed to like it. As noted above, there was put into the silo 9,370 pounds. The amount weighed out was considerably less, being.... 7,950
A loss of about 15 per cent.

2. Corn, late milk stage, and rape, mixed in the proportion of 5,280 of corn to 5,280 of rape, removed and fed on March 18, gave a very excellent sample of ensilage that seemed to suit the palates of all classes of horned cattle even better than the pure corn ensilage. While 10,560 pounds of the mixture was weighed in, only 7,680 pounds was taken out, being a loss of about 33 per cent. Removed from silo.... 7,680

3. Pure corn, late milk stage, came out in condition quite similar to layer 1, and was quite as palatable.

4. Pure Rape, cut as described above, was taken out and fed March 16. It came out in excellent shape, and was eaten with avidity by all classes of cattle. It had a pleasant smell, and a rather pleasing taste. It was not leathery, as any one familiar with rape might have anticipated, but seemed quite as crisp and almost as fresh as when put into the silo. It seemed to be by far the most popular feed that could be given the cattle from among all our succulent feeds, as they would push the corn ensilage and roots away to get at the rape ensilage. The chief objection to be raised is this, that the loss in weight while in the silo is very great. The amount put into the silo was, as already stated, 5,620 pounds, but the amount taken out was only.... 2,590

5. The corn and sunflower came out in good shape, and as usual made good ensilage. The loss was considerable, but not nearly so great as in the case of rape. There was placed in the silo 14,470 pounds, while the amount removed was.... 11,500

6. The horse beans were at the top, and were spoiled entirely. The weight of material taken out, however, was..........	610
Total weight removed was..............	29,330

Percentage loss on pure corn........	15 per cent of gross weight.	
" " corn and rape....	33 " "	
" " pure rape.......	54 " "	

COMPOSITION.

For a full discussion of the composition and nutritive value of these mixtures, the reader is referred to the report of the Chemist, but a few remarks might not be out of place here.

According to the analysis, the rape on going into the silo showed a dry matter content of 13·95 per cent, of which 1·91 was crude protein. When it came out the dry matter content was found to be 21·81 per cent, of which 2·56 was crude protein. Thus, while the loss is still very considerable, it will be observed that it is not nearly so heavy as might be concluded if the weights alone were considered. When the dry matter content of the rape as it entered the silo is computed it is found to be about 784 pounds, while a calculation shows the dry matter content of the rape ensilage as it came out of the silo to be about 565 pounds, a loss of 219 pounds on 784 pounds, or about 26·5 per cent of loss in the feeding value, as nearly as we may judge of feeding value by the chemical composition.

THE EXPERIMENTAL SILO IN 1904.

The experimental silo has been filled again with the following layers and mixtures:—

1.	(Top). Pure corn..............	3,195
2.	Corn..............	5,910
	Alfalfa..............	2,050
3.	Alfalfa. (This alfalfa was part of the third crop off a field of mixed clovers and grasses. A botanical analysis showed about 22 per cent of other clovers and grasses which were of course left in the mixture when it was put in the silo)..............	4,920
4.	Corn..............	4,450
	Alfalfa..............	5,100
5.	Corn..............	4,950
	Alfalfa..............	2,210
6.	Corn (pure)..............	3,390
	Total in silo..............	36,175

This silo was filled on October 7, 1904, and will be fed out during the winter.

AUTUMN CULTIVATION.

For several years early shallow plowing has been advocated and practised on the 200 acre farm, where meadow or pasture land was to be put in grain the next year. Two years ago a field of 18 acres was divided into 3 six acre parts.

One part was plowed 4 inches deep in August, and the land cultivated at intervals until late in October, when the surface soil was gathered together into ridges by means of a double mould board plow and put by for the winter.

Another part was torn up with a stiff toothed cultivator and the loosened soil so exposed to the sun was moved at intervals to allow the grass to die. Late in the fall the field, was ploughed and put by for the winter. The other field was not touched till late in the fall, when it was plowed about 6½ or 7 inches deep and left for the winter.

It was impossible to keep track of the returns from each of the parts separately but appearances were much in favour of the early fall plowing and ridging up.

In the fall of 1903 the experiment was repeated and things arranged to permit of a record of the grain crop being secured for each part. Each lot was 5 acres in area.

Lot 1. Ploughed late in the fall 6 inches deep, disc harrowed twice and harrowed once in the spring, sown with seeder · Yielded 8,553 lbs. of oats.

Lot 2. Cultivated 5 times with stiff toothed cultivator, harrowed 5 times and plowed in late autumn about 6 inches deep, was harrowed once in the spring and sown with the seeder. Yielded 9,995 lbs. oats.

Lot 3. Plowed shallow with gang plow in August; cultivated 3 times; harrowed three times, and then the surface soil gathered into ridges for the winter, was cultivated once in the spring, harrowed once and sown with seeder. Yielded 10,845 lbs. oats.

The three lots were each seeded with clover. Lot 1 was a poor catch; lot 2, a fair catch, and lot 3, a very excellent catch.

It is to be regretted that lot 3 cannot be left in hay in 1905. Lots 1 and 2 will be in hay, however, and will be watched with interest. The experiment is being repeated·

REPORT OF THE HORTICULTURIST.

(W. T. MACOUN.)

December 1, 1904.

Dr. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the eighteenth annual report of this division.

In the following pages will be found the results of some of the most important experiments conducted during the past year, and information regarding other work done.

CHARACTER OF SEASON.

The winter of 1903-4 was the most severe winter that has been experienced in Ottawa for many years, and the past summer has been one of the coolest summers. The frost last winter played great havoc in the orchards of Ontario and Quebec, many fruit trees being killed which had never been previously injured, and in the Essex district the peach trees were nearly all destroyed.

Winter set in on November 16, 1903, and there was sufficient snow for sleighing by November 24, and on the 26th of that month the temperature fell to zero. December, January and February were all very cold months, the temperature only rising above the freezing point three times in December and twice in February, and then only for a short time, there being no real thaw. In January it never thawed. During the winter the temperature fell below zero 58 times, and lower than 20° F. below zero 15 times. In the coldest spell, which lasted from December 26 to January 6, the minimum temperature ranged from 4 to 30 degrees F. below zero for twelve consecutive days, and on 6 of the 12 days it was between 20° and 30° F. below zero. The lowest temperature recorded during the winter was 30·2° F. below zero on January 5. This continuous, dry, cold weather was very hard on fruit trees and a large number were killed. Fortunately, there was a good covering of snow all winter and little, if any frost in the ground, so that vegetation below the snow line was practically uninjured. The snow was at its greatest depth on March 21st., when there were about four feet on the level. There was a thaw on March 22, and by April 1, sleighing was practically gone. By April 11, the snow was out of the orchards and the soil in most of the apple and plum orchards was in condition for ploughing at once. The indications were that the injury from mice would have been great if the trees had not been protected, as a few seedling trees not protected were badly injured. April was a very cool month, with much cloudy weather, the highest temperature recorded being 66° F. on the 24th. On the 20th, there was a heavy fall of snow and good sleighing for cutters. The early part of May was quite warm and owing to the rapid development of the leaves the planting season was much shorter than usual, but it was a fine month for sowing seeds. The highest temperature in May was on the 9th., when the thermometer registered 85° F. There were no frosts in May, and in fact none since April 23. June was a much cooler month than usual. The highest temperature was on the 25th, when it was 87·5° F. There was one warm week in July, but the month on the whole was cool and cloudy, and especially cool at nights. The highest temperature during the month was 95° F. on

the 19th. This was the only day during the summer when it rose to 90 or above. August was also cooler than the average, and while there were a few warm days the temperature did not rise very high, 83·5° F. being the highest reached, on the 5th. The summer was not a favourable one for the ripening of tender vegetables, such as melons and tomatoes, nor for other plants which require warm weather. September was another cool, cloudy month with much rain and not favourable for the ripening of grapes, of which there was a large crop, but of which few kinds matured. There was a severe frost on the night of September 21-22, the temperature falling to 27·5° F. and practically everything tender was killed, including tomatoes, melons, corn, cucumbers, beans and grape leaves. Up to this time, although there had been local white frosts, not registered at the Experimental Farm, there had been no frost recorded and no injury from frost since April 23. October was a very cool month with only about one week of fine, pleasant weather. Severe frosts were frequent, the temperature falling to 19° F. on the 31st. and from the 29th on the frost did not leave the ground, as during the early part of November the weather, though fine, was cold. The frosts were so severe during the second week of November that ploughing was stopped, but most of the frost came out again. Winter set in on November 24, with snow and frost in the ground.

FRUIT AND VEGETABLE CROPS.

In the provinces of Ontario and Quebec the apple crop, although an average one in some places, was not quite as large as in 1903, and below the average on the whole, nor was the fruit as good in quality, being smaller and more spotted in most districts. The crop of pears was good, but peaches and plums were light crops. Owing to the very cool summer and autumn, grapes did not ripen as soon nor as well as usual, but there was a good crop in most places, although the black rot was very destructive in some cases. There was a light crop of strawberries in western Ontario owing to winter-killing of the plants, but in eastern Ontario and the province of Quebec the crop, although lighter than usual, was not much below the average. The raspberry crop was good.

The fruit crop at the Central Experimental Farm was, on the whole, a good one. There was a large crop of apples, the fruit being clean and of good size. There was a fine crop of Americana and Native plums, and the fruit was larger than usual. The strawberry crop, although not as large as in some other seasons, was not much below the average; while currants, raspberries and gooseberries all bore well. There was never a better crop of grapes here, but owing to the cool autumn comparatively few kinds ripened thoroughly.

Some kinds of vegetables were not very satisfactory this year owing to the cool weather, the crop of tomatoes being light, and melons almost a total failure except where forced. The yields from the experimental plots of potatoes averaged well.

MEETINGS ATTENDED, PLACES VISITED AND ADDRESSES DELIVERED DURING THE YEAR.

Annual meeting, Quebec Pomological Society, Hemmingford, December 17-18, 1903. Address: 'Why Fruit Trees Die or Fail to Produce Fruit.'

Annual meeting, Nova Scotia Fruit Growers' Association, Bridgewater, N.S., January 27-28, 1904. Address: 'Causes of Failure in Beginning Fruit Growing.'

Farmers' Institute Meeting, Orillia, Ont., January, 11-12, 1904. Address: 'Orchard Management and Work of the Dominion Experimental Farms.'

International meeting, Port Huron, Mich., U.S., March 3-4, 1904. Address: 'Hardy Fruits for Cold Climates.'

Hamilton Horticultural Society, Hamilton, Ont., March 24, 1904. Address: 'Hardy Climbers, with Notes on some of the Newer Annuals and Perennials.'

Guelph Horticultural Society, Guelph, Ont., March 25, 1904. Address: 'Hardy Climbers for the Home Grounds.'

Canadian Florists' Association, Ottawa, Ont., August 9-10-11. Address: 'Hardy Perennials Suitable for Florists.'

Orchard meetings, at Cumberland, Hazeldean and City View, Ont., August 15-16-17, 1904. Address: 'Demonstrations in Orchard Management.'

Summer meeting, Quebec Pomological Society, St. Jerome, Que., August 24-25, 1904. Address: 'Hints to Beginners in Fruit Culture.'

St. Catharines Horticultural Society, St. Catharines, Ont., September 12, 1904, 'Work of the Horticultural Society.'

Annual meeting, Ontario Fruit Growers' Association, Toronto, Ont., November 15-19, 1904, 'Hardy Climbing Plants,' 'Report on New Fruits,' 'Discussion on Grape Rots.'

The following places were also visited during the year for the purpose of obtaining information which would be of service in furthering the fruit-growing interests of Canada. Returning from the summer meeting of the Quebec Pomological Society, I drove through the fruit districts of Dundas county, Ontario, visiting particularly the orchards of A. D. Harkness and Dr. Harkness, Irena, Ont., and Allan McIntosh, Dundela, Ont. Here were seen the oldest McIntosh Red apple trees in existence, including the original McIntosh Red tree itself, which is now almost dead. At Irena, Dundela and vicinity there are orchards of McIntosh Red apples producing from 100 to 200 barrels of this delicious variety. On September 4 and 5 I visited the Toronto Exhibition, and in studying the collections of fruit there, added considerably to my knowledge of varieties. On the occasion of my attendance at the meeting of the St. Catharines Horticultural Society, I took the opportunity of visiting a number of vineyards at St. Catharines and Winona in order to study the diseases of the grape which are causing much loss in the vineyards there, the Black Rot especially being very destructive. From October 17 to 22, I visited the World's Fair at St. Louis and made a careful comparison of the fruit exhibits form the various States and Canada, and had a particularly good opportunity of examining the different collections, as for two days I acted as a temporary judge. While at St. Louis I took the opportunity of visiting the Missouri Botanical Gardens, and in comparing the gardens there with our own, and examining the specimens was able to carry away impressions which may be put to good use. On my way home I visited the orchards of W. H. Dempsey, Trenton, Ont., and others in that district and studied the methods of picking, packing and storing apples employed in this fine apple district. While here I was able to obtain some good fruit for the Canadian exhibit at the World's Fair.

ACKNOWLEDGMENTS.

I can but repeat this year the expression of appreciation made in past years of the work done in my department by Mr. J. F. Watson and Mr. H. Holz. The efficient manner in which the work they had to do has been accomplished is both gratifying to myself, and, I believe, a credit to the department. I also again wish to thank all those persons both in Canada and the United States who have, by the information so kindly furnished and by the plants, scions and seeds donated, and in other ways, aided me in trying to promote the horticultural interests of Canada.

DONATIONS.

There has been a large number of donations again this year which are gratefully acknowledged herewith. Some of the most valuable and interesting things which have been tested by the horticultural division are received in this way :—

Sender.	Donation.
Arnold Arboretum, Jamaica Plain, Mass..	100 species Crataegus and other plants.
D. F. Aikin, Farmington, Minn..	Scions, seedling apple.
H. Beyer, New London, Iowa..	6 plants Everbearing raspberry.
Botanic Garden, Upsala, Sweden..	Collection of seeds.
R. Brodie, Westmount, Q..	Scions, Ogilvie apple.
Botanic Garden, Lausanne, Switzerland..	66 packages of seeds.
Botanic Garden, Karlsruhe, Baden..	58 packages of seeds.
Thos. Connolly, Lindsay, O..	Scions, seedling apple.
Wm. Craig, Abbotsford, Q..	Scions, Victoria apple.
Mr. L. Cameron, Iroquois, O..	Buds of seedless apple.
J. K. Darling, Almonte, O..	Scions, unknown apple.
B. Edwards, Covey Hill, Q..	Apple scions.
Geo. Fraser, Ucluelet, B.C..	Plants of "Pyrus rivularis."
H. N. Grant, Newtonbrook, O..	Scions, seedling apple.
A. Harkness, Lancaster, O....	Scions, unknown apple.
Robert Hamilton, Grenville, Q..	Scions, seedling apple.
A. D. Harkness, Irena, Ont..	Scions, seedless apple.
C. P. Hanon, Mount St. Hilaire, Q..	Scions of red apple.
N. E. Jack, Chateauguay Basin, Q..	Queen Mary plum scions.
Daniel, Lack, Lindsay, Ont....	Scions, seedling apple.
J. S. Littooy, Everett, Wash..	6 plants Superlative raspberry .
Prof. J. Macoun, Ottawa, Ont..	Bulbs of "Erythronium grandiflorum."
E. Morris, Fonthill, Ont..	Scions, McDonald apple.
Prof. J. Macoun, Ottawa, Ont..	Evergreens from Rocky Mountains.
D. C. McKinnon, Atherley, O..	Scions, seedling apple.
Geo. H. McMillan, Dunbar, O..	I case of Bug Death.
New York Experiment Station, Geneva, N.Y....	Scions, seedling apple.
C. P. Newman, Lachine Locks ,Q..	Grape cuttings.
A. W. Peart, Leamington, O..	Scions, seedling apple like McIntosh also Williams' Favorite.
E. M. Richardson, Toronto, O..	Scions, unknown apple.
Heber Rawlings, Forest, O..	Ash Leaf Kidney potato.
Royal Gardens, Kew, England..	Collection of seeds.
Royal Botanic Gardens, St. Petersburg, Russia.	Packages of seeds.
N. Smith & Son, Adrian, Mich..	6 plants "Helianthus sparsifolia."
C. H. Snow, Cumming's Bridge, O..	Scions, Red Sports of St. Lawrence apple.
C. L. Stephens, Orillia, Ont..	Scions, hardy peach and Red Russet apple.
F. G. Semple, Brule, N.S..	Scions, unknown apple.
Stark Bros., Lousiana, Mo..	Scions, E. 5, Z. 26, Bay and Black Ben Davis apples.
C. L. Stephens, Orillia, O..	Scions, apples and plums.
Wm. Stark, Kelso, Scotland..	Northern Star potato.
A. E. Sherrington, Walkerton, O..	Scions, Sweet Bough and Northern Spy apples.
Robert Thompson, St. Catharines, Ont..	Scions, unknown apple.
Prof. F. A. Waugh, Amherst, Mass..	Plants of "Prunus Besseyi."
H. E. Wright, Summerside, P.E.I..	Scions, Abegweit plum.
C. W. Young, St. Stephen, N.B..	2 Dickey Bug Death Dusters.

I have the honour to be, sir,
Your obedient servant,

W. T. MACOUN,
Horticulturist.

APPLES.

The winter of 1903-4 was the severest in the history of the Central Experimental Farm and the coldest on record in this district. In the orchards at the farm, 306 apple trees were killed, including 164 varieties. Owing to the good covering of snow there was no root killing, many trees being merely killed to the snow line, this point being

clearly marked on the trunk in most cases. The vacancies caused by the death of the trees were most of them filled by varieties not hitherto tested, and by those which had proven hardy and were desired in larger numbers.

APPLE CROP.

Notwithstanding the severe winter, the apple crop was good at the farm this year and the fruit was clean, being without spot and exceptionally free from Codling Moth.

SEEDLING AND CROSS-BRED APPLES.

This year 192 seedlings of good varieties were added to those planted during the past four years, making the total number of apple seedlings of good varieties 1,788. Some work in cross-breeding apples was also accomplished, and the seeds obtained were sown this autumn. Some of the trees of the crosses between McIntosh Red and Lawver are approaching fruiting age and some good varieties are hoped for from these, as well as from the seedlings. This year 17 different crosses between McMahon White and Scott's Winter fruited, but although most of these resembled either or both parents in some respects, it is doubtful if any of them will be superior. There are three resembling Scott's Winter, but larger, which possibly may be useful.

EFFECTS OF WINTER KILLING ON TOP GRAFTED TREES.

During the past six years, 90 varieties of apples have been top grafted on hardy stocks with the object of determining whether varieties which would not succeed when grown in the ordinary way would prove satisfactory when top grafted on stocks having hardy trunks. The experiment was proving very interesting and some varieties were apparently going to succeed when tested in this way, but last winter came and killed practically all those which had proven tender when tried as standard trees. Anyone who thinks that hardy stocks will make the graft noticeably hardier will have abundant proof that such is not the case from the following table. The dividing line between graft and stock was very marked in all cases examined. A Northern Spy, which had been top grafted on Duchess for 13 years, was killed completely back to the stock, which was as healthy as ever; and many other instances might be quoted. Two varieties of apples were top grafted on Wealthy in 1891. One of these, the Milwaukee, a hardy variety, and another, the Martha. Each variety occupied about half the top of the tree. The Martha was all killed, while the Milwaukee remained alive and bore a good crop of fruit. Top grafting will bring a tree into bearing sooner and will permit of growing varieties which sunscald on the trunk or are weak in the trunk in other respects, but the grafts if made any hardier are not sufficiently so to stand very severe winters.

In the following table will be found the names of the varieties of apples, 164 in number, which were killed last winter with the earliest dates of planting or top grafting the trees killed. Other varieties had been killed previous to last winter which are not recorded in this table, the Ben Davis being one of these. There were a few varieties of which one or more trees were killed, but others left uninjured, which are not included in the table, as they had proven so hardy up to last winter in this district. Among these may be mentioned American Golden Russet, Pewaukee, Baxter, and Canada Red, which are hardy enough to be given a further trial:—

VARIETIES of Apples Winter-killed, 1903-1904.

Name.	Number of Standard or Top-grafted Trees, Winter-killed, 1903-1904.	First Dates of Planting or Top-grafting
Allen's Choice	2 st.	pl. 1897.
Allington Pippin	1 st.	pl. 1899.
Almond Reinette	1 st.	pl. 1895.
Arctic	1 st., 4 t. gr.	pl.'98, t.g.'97
Arkansas Black	2 st.	pl. 1896.
Aport (White Alexander)	1 st.	pl. 1897.
Aurora	1 t. gr.	t. gr., 1900.
Baldwin	1 st., 2 t. gr.	pl.'00, t.g.'99
Bayard Williams	1 st.	pl. 1899.
Belle de Boskoop	1 st., 1 t. gr.	pl.'00, t.g.'98
Bedfordshire Foundling	1 st.	pl. 1899.
Black Annette	1 st.	pl. 1899.
Blenheim Pippin	2 st., 1 t. gr.	pl.'97, t.g.'03
Bohemian Favorite	1 st.	pl. 1903.
Boiken	4 st.	pl. 1892.
Boy's Delight	3 st., 1 t. gr.	pl.'97, t.g.'01
Bottle Greening	1 st.	pl. 1900.
Bramley's Seedling	2 st.	pl. 1902.
Burlovka	2 st.	pl. 1888.
Carliss Red	1 t. gr.	t. gr., 1900.
Carthouse	1 st.	pl. 1903
Chenango Strawberry	1 st.	pl. 1900.
Chelibi	1 st.	pl. 1896.
Cooper's Market	1 st.	pl. 1900.
Colvert	1 st.	pl. 1903.
Cox's Orange Pippin	2 t. gr.	t. gr., 1903.
Delicious	1 st.	pl. 1901.
Dempsey No. 80	1 st.	pl. 1895.
Devonshire Quarrenden	1 st.	pl. 1899.
Dr. Noyes	1 st.	pl. 1903.
Dr. Walker	2 st.	pl. 1891.
Domine	1 st.	pl. 1901.
Duffey's Seedling	1 t. gr.	t. gr., 1901.
Ecklinville Seedling	1 st.	pl. 1902.
Edgehill	2 st.	pl. 1893.
Eisike	2 st.	pl. 1895.
Empress	1 st.	pl. 1899.
English Pippin	1 t. gr.	t. gr., 1896.
Esopus Spitzenburg	1 st., 2 t. gr.	pl.'00, t.g.'02
Fall Jenetting	3 t. gr.	t. gr., 1900.
Fall Pippin	1 st.	pl. 1900.
Fallawater	2 st., 2 t. gr.	pl.'00, t.g.'98
Fameuse Noire	3 st.	pl. 1893.
Fillipa's Apfel	1 st.	pl. 1899.
Flat Aport	1 st.	pl. 1901.
Flushing Spitzenburg	2 st., 1 t. gr.	pl.'02, t.g.'03
Forest No. 3.	1 st.	pl. 1901.
Forest No. 4.	1 st	pl. 1901.
Gascoigne's Seedling	1 st.	pl. 1901.
Gano	4 st.	pl. 1901.
Ghent T.	2 st., 1 t. gr.	pl.'95, t.g.'03
Gideon No. 20	1 st.	pl. 1902.
Graham, I. J., from	1 st.	pl. 1901.
Golden Stone	1 t. gr	t. gr., 1891.
Goode	1 st.	pl. 1900.
Gravenstein	1 t. gr.	t. gr., 1903.
Greenfield Seedling	1 st.	pl. 1899.
Grimes' Golden	2 t. gr.	t. gr., 1903.
Hebble	1 st.	pl. 1901.
Henzen's Gravenstein	1 st.	pl. 1899.
Höfgërtner Braun	1 st	pl. 1899.
Holly	1 st.	pl. 1901.
Hoover's Seedling	1 st.	pl. 1898.
Hoover's Red Seedling	1 st.	pl. 1897.
Hubbardston	1 t. gr.	t. gr., 1903.
Huntsman	1 st	pl. 1891.
Hurlbut	1 t. gr	t. gr., 1901.
Hybrid No. 37 (Iowa)	1 st	pl. 1897.
Jacob's Sweet	1 st.	pl. 1900.
Johnston, Asa, No. 2, from	1 st.	pl. 1902.
Johnston, Asa, No. 7, from	1 st.	pl. 1901.
Kara Synap	2 st., 1 t. gr.	pl.'96, t.g.'91
Keswick Codlin	1 st., 1 t. gr.	pl.'00, t.g.'98
Kinkead	2 st.	pl. 1902.
King	1 t. gr.	t. gr., 1901.
Knight's Greening	1 st.	pl. 1901.
Knight's No. 2	1 st.	pl. 1899.
La Victoire	1 st.	pl. 1902.
Lady	1 st.	pl. 1888.
Lady Sudeley	1 st.	pl. 1899.
Lady Washington	1 st.	pl. 1897.
Lake's Pippin	1 st.	pl. 1896.
Lanark Greening	1 st.	pl. 1902.
Lamb Abbey Pearmain	1 st.	pl. 1902.
Lane's Prince Albert	2 st.	pl. 1899.
Lawver	6 st., 1 t. gr.	pl.'99, t.g.'99
Leaf, W. H., from	1 st.	pl. 1897.
Legal Tender	1 st.	pl. 1901.
Lord's Late	1 t. gr.	t. gr., 1899.
Louise	2 st.	pl. 1893.
Mann	3 st.	pl. 1890.
Marsh, J. D., from	1 st.	pl. 1901.
Martha (not crab)	1 t. gr.	t. gr., 1891.
Messenger, R., from	1 t. gr.	t. gr., 1903.
Merrit	1 st.	pl. 1901.
Milding	2 st.	pl. 1897.
Minkler	1 st.	pl. 1893.
Missouri Pippin	3 st., 1 t. gr.	pl.'90, t.g.'02
Mitchell's No. 5	2 st.	pl. 1896.
Mother	1 t. gr.	t. gr., 1900.
McCallum No. 102	1 st.	pl. 1899.
McLure Pippin	1 t. gr.	t. gr., 1901.
New Winter H'wthornd'n	1 st	pl. 1900.
Newell's Winter	1 t. gr	t. gr., 1903.
Nodhead	2 st., 1 t. gr.	pl.'99, t.g.'03
Northern Spy	1 st., 2 t. gr.	pl.'99, t.g.'91
Ontario	3 t. gr.	t. gr., 1899.
Peasegood Nonsuch	1 st.	pl. 1899.
Perry's Russet	1 st.	pl. 1900.
Pomme Grise	1 st.	pl. 1888.
Primate	2 t. gr.	t. gr., 1900.
Princess Louise	1 st.	pl. 1899.
" of Denmark	1 st.	pl. 1899.
Ramsay, A. J., No. 2, from	1 st.	pl. 1898.
Red Detroit	2 st.	pl. 1901.
Red Subluck	2 st.	pl. 1895.
R. I. Greening	1 st., 1 t. gr.	pl.'00, t.g.'03
Ribston Pippin	3 st., 1 t. gr.	pl.'00, t.g.'03
Rockwood	1 t. gr.	t. gr., 1902.
Rome Beauty	1 t. gr.	t. gr., 1902.
Rubicon	2 st.	pl. 1895.
Ruby Gem	3 st.	pl. 1893.
St. Johnsbury	1 st.	pl. 1899.
Salome	3 st.	pl. 1888.
Sambo	2 st.	pl. 1895.
Saxton	1 st.	pl. 1899.
Senecal	1 st.	pl. 1899.
Shackleford	2 st.	pl. 1899.

VARIETIES of Apples Winter-killed, 1903-1904—*Concluded.*

Name.	Nunder of Standard or Top-grafted Trees, Winter-killed, 1903-1904.	First Dates of Planting or Top-grafting	Name.	Number of Standard or Top-grafted Trees, Winter-killed, 1903-1902.	First Dates of Planting or Top-grafting
Shannon	1 st.	pl. 1900.	Vermont Sweet	2 st.	pl. 1899.
Sklianka	2 st.	pl. 1888.	Wagener	2 t. gr.	t. gr., 1902.
Smith's Cider	1 st.	pl. 1902.	Walworth Pippin	1 st.	pl. 1895.
Spencer	2 st., 1 t. gr.	pl. '91, t.g. '02	Warner's King	1 st.	pl. 1892.
Springdale	1 st.	pl. 1897.	Washington Royal	1 t. gr.	t. gr., 1903.
Starr	2 st.	pl. 1899.	Westfield Seek No Further	4 st., 1 t. gr.	pl. '90, t.g. '01
Stark	3 st., 2 t. gr.	pl. '01, t.g. '03	Willow Twig	1 st.	pl. 1903.
Stettin No. 80	1 st.	pl. 1896.	Windsor Chief	1 st.	pl. 1895.
Stuart's Golden	1 t. gr	t. gr., 1903.	Winesap	2 st.	pl. 1900.
Sturmer Pippin	1 st.	pl. 1902.	Winter Banana	1 t. gr.	t. gr., 1903.
Sugar Sweet	1 st.	pl. 1893.	Winter Bough	2 st.	pl. 1889.
Sutton Beauty	1 t. gr	t. gr., 1902.	Winter Duchess	1 st.	pl. 1889.
Summer King	1 st.	pl. 1903.	Winter Calville	1 st.	pl. 1899.
Svintzovka	1 st.	pl. 1892.	Winter Maiden's Blush	3 st.	pl. 1899.
Swaar	1 st.	pl. 1900.	Winter Rambour	1 st.	pl. 1895.
The Jake.	1 st.	pl. 1896.	Yellow Bellflower	2 t. gr.	t. gr., 1901.
The Queen	4 st.	pl. 1901.	York Imperial	1 t. gr.	t. gr., 1901.
Tom Putt	1 st.	pl. 1902.			
Trdika	1 st.	pl. 1899.			

REVISED LIST of varieties of apples recommended for the province of Ontario between latitudes 45° and 46° and along the north side of the St. Lawrence river in the province of Quebec to about Three Rivers (District No. 7, Bulletin 37.)

Owing to the winter killing of some varieties of apples last winter, which were previously thought to be hardy, it is necessary to revise the list of apples recommended for this district. The only important changes which occur, however, are in the winter varieties.

Summer.—Yellow Transparent, Duchess of Oldenburg.

Autumn.—St. Lawrence, Wealthy, Alexander.

Early Winter.—McIntosh Red, Fameuse.

Winter.—Scott's Winter, Milwaukee, North Western Greening, Canada Baldwin, and Golden Russet in the more favoured localities.

Additional varieties suggested for home use:—

Summer.—Lowland Raspberry, Early Joe, Russell, Dyer.

Winter.—Swayzie Pomme Grise, Grimes Golden.

A CLOSE-PLANTED WEALTHY ORCHARD.

In the Annual Report for 1902, an account was given of a close-planted orchard of Wealthy apple trees. The receipts and expenses in connection with this orchard, from the time the trees were planted until the autumn of 1902, were published in that report. It was shown that from a little less than one-third of an acre of trees planted 10 by 10 feet apart in the spring of 1896 the receipts had been $307.01, or at the rate of $940.15 per acre, and the expenses per acre $454.62, leaving the net receipts per acre $485.53. The trees began bearing well in 1899 and the receipts represent the money obtained for the fruit for four years' crops. These net receipts meant an average per year of fruiting of $121.38 per acre. There are 131 trees in this orchard left out of an original number of 144.

The crop in 1903 was a light one, being 161 gallons picked fruit, and 162 gallons windfalls, or a total crop of about 13½ barrels, but this year it was very good, and while the fruit was smaller it was highly coloured, and sold as well as could be expected on such a glutted market as there was this year.

In the following table will be found the receipts and expenditure from the year 1899, when the trees began to bear well, until the autumn of 1904. The expenses before 1899, including rent of land, cost of trees, planting and cultivating are estimated at $150 per acre.

Receipts.		Estimated per acre.
1899-1902	$ 307 01	$ 940 15*
1903, sold 88 baskets at 17½ cts.	20 80	62 92
1904 " 60 boxes (Dublin) 4s. 6d. ($1.09)	65 40	197 83
" 30 boxes 3s. 6d. (85cts)	25 50	77 14
" 30 boxes (Glasgow) 5s. ($1.22)	36 60	110 71
" 46 baskets at 20cts.	9 20	27 83
" 42 baskets at 17½ cts.	7 35	22 23
" 53 bags (X grade) 30cts.	15 90	48 10
Total receipts, 1899-1904	$ 487 76	$1,486 91

Expenses.

	Estimated per acre.
1896-1899—Estimated expenses per acre including rent of land, cost of trees, planting and cultivating	$ 150 00
1899-1902 (For details see report for 1902). Total expenses per acre	454 62
1903, Rent of land	3 00
Spraying	9 44
Cost of baskets (baskets at 5½ cts. each)	14 64
Cost of picking	8 05
Cost of packing	5 32
Commission on sales	6 29
1904, Rent of land	3 00
Spraying	9 44
Cost of boxes and baskets (boxes at 14½ cts., baskets 6¼ cts)	69 27
Cost of picking	60 50
Cost of packing and grading fruit in boxes, including excelsior and cardboard	69 01
Cost of packing baskets	5 32
Freight, &c., on boxes of fruit sold	115 24
Commission on fruit sold in boxes	11 62
Commission on fruit sold in baskets	4 99
Total expenses, 1896-1904	$ 999 75
Total receipts per acre, 1896-1904	$1,486 91
Total expenses per acre, 1896-1904	999 75
Net receipts	$ 487 16
Average profit per acre per year, 1896-1904	$ 54 13
Average profit per acre per year, 1899-1904	106 19

*Part of this estimate of $940.15 is based on the yields from 139 trees and part from 144. Five trees died previous to 1899 and were not replaced, hence it was considered fairer to estimate from those that remained. In 1902 and since, however, the yields have been estimated on the area occupied by the original plantation of 144 trees, as this area now is fully occupied by the trees.

(By Frank T. Shutt.)

WEALTHY APPLE ORCHARD (CLOSE PLANTED) IN BLOOM.

(By Frank T. Shutt.)

APPLE TREE TOP GRAFTED WITH TWO VARIETIES.

(ONE VARIETY WINTER KILLED, OTHER UNINJURED AND REQUIRING PROPS TO SUPPORT LOAD OF FRUIT.)

HORSE BEAN COVER CROP SHOWN IN THE FOREGROUND.

These expenses are estimated from about one-third of an acre and on the assumption that the percentage of sales in boxes and bsakets would be the same from a full acre. There was no expense for cultivating either in 1903 or 1904, as the trees being close, cultivation was impracticable. There was no expenditure on barn-yard manure or chemical fertilizers in 1903 or 1904, as none were applied up to the time of making these calculations.

While this system of close planting is not recommended for general adoption, it is well worthy of a trial by fruit specialists who will give sufficient attention to it. Only a few varieties of apples are suitable for close planting, Wealthy being one of the best, and Wagener probably almost as good, on account of their early bearing habit. The Wealthy orchard at the Central Experimental Farm will receive a good dressing of barnyard manure this winter. As the trees are now meeting and it would be unwise to continue to grow them as thick any longer, an experiment will be tried next spring of heading back a proportion of the trees severely, the object being to re-head the trees alternatively, thus keeping up the vigour and allowing light to get at the fruit. If this is not found satisfactory some of the trees will be removed altogether. The total crop this year on about one-third of an acre was 2,134 gallons, about 90 barrels, or at the rate of about 270 barrels to the acre. Thtere were 564 gallons windfalls and 1,570 gallons picked fruit. There are still 131 trees of the original 144 alive, most of them in a thrifty condition.

EXPERIMENTAL APPLE SHIPMENTS TO IRELAND AND SCOTLAND IN 1904.

In 1902 and 1903 experimental shipments of apples in boxes were made to Glasgow, Scotland, with gratifying results, both in regard to the condition in which the fruit arrived on the other side and in the prices obtained for it. The information furnished in the annual report regarding sales and cost of shipment proved very acceptable to growers in Canada who had not had any experience in shipping apples and who did not know how to go about it.

As agents in Ireland had been requesting Canadian fruit growers to give the Irish market a trial this year, it was thought that useful information would be obtained by making some experimental shipments there. This was considered particularly desirable this year when there was such a large crop of apples in England and it was thought the Irish market would not be as well supplied with home-grown fruit, and better prices would therefore be obtained. The crop in Ireland, however, was a very large one also, and the prices obtained for summer and autumn apples from Canada was low, in some cases not covering the cost of shipment.

Six shipments in all were made, four being to Belfast, Ireland, one to Dublin, Ireland, and one in Glasgow, Scotland, for comparison. All the apples were packed in boxes 10 x 11 x 20 inches, inside measurement. The fruit was placed in regular rows and tiers in the boxes with a sheet of cardboard above and below and a very little excelsior between the cardboard and the sides of the box. The Charlamoff apples in the second shipment were wrapped in tissue paper, and the Anis and Winter Stripe in the third shipment, the others were not wrapped. As a rule the apples were well coloured but still hard, with the exception of the Duchess apples in the first shipment, which were not as well coloured as in the second, being picked earlier. The fruit was inspected by the Dominion fruit inspectors at Montreal and all graded XXX.

Following is a table showing the prices obtained for the different varieties, the date and steamer on which they were shipped ; name of variety, number of boxes, selling price per box, destination and route, and whether sent in cold storage or not. It will be seen from the table below that fair profits for the season were had from the Dublin and Glasgow shipments. The fruit sent to Belfast realized considerably less. The charges on these are not yet available, but it is expected the returns will not do much more than cover expenses.

Date of Shipment.	Destination and Route.	Name of Steamer.	Name of Variety.	Number of Boxes.	Selling Price, per box.	Cost of Shipment, including cost of boxes, packing, material, freight, commission, &c.	Profit.
1904.					s. d.	$ cts.	$ cts.
Aug. 20	Belfast *via* Liverpool (cold storage)	Dominion.......	Duchess........	100	2 0	....	
" 27	" " " ..	Vancouver......	"	55	2 0	....	
" 27	" " " ..	"	Charlamoff (Pointed Pipka)	70	3 6	....	
Sept. 14	Belfast (direct)...............	Bray Head......	Antonovka	46	1 6	....	
" 14	" "	"	Anis.........	24	2 6	....	
" 14	" "	" ".....	Dudley........	12	2 6	....	
" 14	" "	" ".....	Winter Stripe..	12	2 6	....	
" 14	" "	" ".....	McMahon White..	6	2 6	....	
" 18	Dublin (direct)..................	Inishowen Head	Wealthy.......	70	4 6	66 79	35 48
" 18	" "	" ..	"	30	3 6		
" 29	Glasgow (direct)	Parthenia......	"	30	5 0	31 28	12 55
" 29	" "	"	Patten's Greening..	10	3 0		
" 30	Belfast (direct)....	Dunmore Head..	Wealthy.......	20	3 0	....	
" 30	" "	" ..	McMahon White..	5	3 0	....	

The following quotations from letters received from the consignees show the condition in which the fruit arrived, and give the criticisms made upon it. These are published for the guidance of fruit growers in the future. It is very satisfactory to know that no complaints were made with regard to the packing of the fruit nor of the condition in which it arrived.

REPORT OF FIRST SHIPMENT OF DUCHESS APPLES IN COLD STORAGE TO BELFAST, IRELAND.

'BELFAST, September 7, 1904.

'I have received the 100 boxes of Duchess apples this week, and the quality of the apples is rather disappointing, as it is not good enough for eating, and for cooking, buyers prefer our own Irish apples which are an exceptionally good crop this year and very cheap. Had they been a nice good keeping eating apple and a good colour, I could have sold them, I think, very well. They are certainly very well put up and the packing very good, in fact, one of the largest buyers told me he would take the whole of the apples if they had been suitable, but he would not take a box when he saw them. He said he was quite prepared to pay me 4d. for as many of the empty boxes as I could get him, but the apples to him were useless, as they would not suit his customers at all. What we want is a nice dessert apple. We have plenty of the cooking grade here. There was only one buyer that would make me an offer at all, and the best he would make me was 2s. per box ex quay.'

(Signed) 'HUGH GORDON.'

EXTRACT FROM REPORT OF SECOND SHIPMENT (DUCHESS AND CHARLAMOFF).

BELFAST, September 14, 1904.

'The second consignment of apples has arrived, and as requested, I have examined the boxes and notice the way you have them packed. They are certainly very well put up, but some of the largest fruit merchants here state that they are the wrong kind of apples (they were Duchess and Charlamoff) you are shipping, as they will

keep no time and would have to be disposed of immediately they arrive, and as there is considerable risk to the buyer, he will not be willing to give a very big price for them, as the Irish apples are so plentiful this year and are being sold at very low prices. One of the largest fruit merchants in Belfast informed me that if you could get him any barrels of Alexander apples that he would have a ready sale for them, in fact, he said that the demand was entirely on barreled apples as the boxes were difficult to place, as there is so very little bulk, and of course the prices must be higher in consequence of the expense of packing. Have only been able to get 3s. 6d. for Pipkas (Charlamoff) and 2s. for Duchess ex quay Belfast.'

(Signed) 'HUGH GORDON.'

EXTRACT FROM REPORT OF THIRD SHIPMENT (ANTONOVKA, WINTER STRIPE, ANIS, DUDLEY).

'BELFAST, October 27, 1904.

'*Re* 100 boxes of apples, they came in good order, but as I have already wrote you, you are not shipping the right sort of apple at all. What we want is a good eating apple somewhat similar to good Baldwins and packed in barrels. Apples are so very cheap here that it is impossible to get a decent price for them, and I don't know what you think of the grade you are shipping, but buyers do not care for them at all, the flavour not being nice like Baldwins. I sold 46 boxes at 1s. 6d. per box. Winter Stripe, Anis, Dudley and McMahon White, I sold at 2s. 6d. per box, less the freight, so that after deducting the freight I have practically nothing left for the apples. As you are aware, this is a very bad year for experimenting with apples, and I believe that apples in barrels would do a great deal better than in boxes as they would come cheaper.'

(Signed) HUGH GORDON.

EXTRACT FROM REPORT OF FOURTH SHIPMENT (WEALTHY).

DUBLIN, October 19, 1904.

'I duly received the consignment of 100 boxes, Wealthies per SS. *Innishown Head.* They arrived in very good condition, presenting a fine appearance when opened. The only thing I noticed in respect to the boxes was that a few of them had the end pieces broken across, but this did not cause any damage to the contents. The trip occupied twelve days and it was four days after the steamer arrived here before I got delivery, thus making sixteen days from the time of shipment, and considering that the consignment did not come in cold storage, the result was very satisfactory, as the whole lot looked as well as could be desired. If this direct shipment can be utilized by Canadian shippers it would mean a very large saving in rates. The prices realized for this consignment, namely: 30 boxes at 3s. 6d. and 70 at 4s. 6d. were not as high as I expected, but this was owing to the enormous crop of Irish grown apples on the market and some very large consignments of States fruit. The crop of Irish apples this year is the largest for ten years, but will be very quickly worked off. The consignment you sent is the very thing we want here; good colour and sound, well packed, There is no market for Canadian or American green apples suitable only for cooking.'

(Signed) 'J. H. SHERIDAN.'

EXTRACT FROM REPORT OF FIFTH SHIPMENT (PATTEN'S GREENING, AND WEALTHY).

'GLASGOW, October 19, 1904.

'I beg to send you herewith account sale for your consignment of 40 boxes apples ex steamer *Parthenian*, and draft for £5 11s. 1d. sterling in settlement of net proceeds, which please acknowledge. I can assure you we did the very best possible with this lot of apples, and trust that the result is satisfactory to you. They arrived here in

prime condition and sold well under the conditions of the market. As you are doubtless, aware, large quantities of apples have been coming on the British markets this season and prices have ruled low, but for good coloured fruit lately we have experienced a strong demand in view of the near approach of Hallowe'en festivities, while for green fruit, such as Greening, Colverts and such like varieties, there has been a very poor sale owing to the large quantities of English and continental of like description.

(Signed) 'THOS. RUSSELL.'

EXTRACT FROM REPORT OF SIXTH SHIPMENT (WEALTHY AND M'MAHON WHITE).

'BELFAST, November 19, 1904.

'With reference to the last consignment of 25 boxes of apples, Wealthy and McMahon White, the Wealthy apples were certainly very nice, good flavour, but of course a shade smaller. I was unable to get a very big price for them. As I explained to you before, the Irish apples were so very plentiful, I sold them at 3s. a box to Lennon Bros. Are you able to quote apples in barrels yet, as there is a far greater demand for them than the boxes ?

'HUGH GORDON' (per).

SEEDLING FRUITS.

There have not been quite as many seedlings sent in this year as in 1903, but most of those received were above the average seedlings sent in for examination in the past. Full descriptions are published of those which were thought to be the most promising, and partial descriptions of those which are not of special merit.

As scions of most of the best seedlings which are received from year to year are obtained from the grower, a very fine collection of seedlings is being got together here, some of which should prove superior to those now generally grown.

It is hoped that anyone who has a promising seedling will send fruit for examination to the Horticulturist, Central Experimental Farm, Ottawa.

All the seedlings described below are apples, with the exception of one plum.

291. J. Gossley, Richmond Hill, Ont.—(No. 12 seedling). Medium size, sparsely splashed with purplish red. Quality good, but not attractive. Season, winter.

292. J. Gossley, Richmond Hill, Ont.—Medium size ; form roundish, slightly angular; cavity deep. open; stem broken; basin medium depth and width, smooth; calyx open; colour yellow, well splashed and washed with bright red; dots few, small, yellow, indistinct; skin moderately thick, tough; flesh yellow, crisp, tender, juicy; core medium; subacid, flavour pleasant; quality good to very good; season apparently mid to late winter. Tree said to be a cross between Canada Red, Baldwin and Spy. Much like Spy in appearance and flavour, but is not as good flavour as Spy.

293. F. C. Judd, Doe Lake, Ont.—Medium size, splashed and streaked with bright red, medium quality. Season, October.

294. F. C. Judd, Doe Lake, Ont.—Medium size; yellow, red about cavity; quality above medium to good. Season late September.

295. J. W. Morrison, Acton's Corners, Ont.—Above medium size, bright red, medium quality. Season late September to October.

296. J. W. Morrison, Acton's Corners, Ont—Medium size, pale yellow; quality above medium. Season September.

297. J. W. Morrison, Acton's Corners, Ont.—Medium size, pale yellow with a pinkish blush; quality above medium. Season early to mid-winter.

298. C. H. Snow, Cummings' Bridge, Ont.—Winter Greening; medium size, pale greenish yellow with a pinkish red blush, quality above medium. Season mid to late winter.

299. H. N. Grant, Newtonbrook, Ont.—Medium size; form roundish, slightly angular; cavity medium depth and width; stem medium length, slender; basin very deep, open, wrinkled; calyx open; colour yellow washed with dark red; dots obscure; skin thick, moderately tough; flesh yellow, tender, juicy; core small; mildly subacid, pleasant flavour; quality good; season probably mid to late winter. Seedling tree growing near fence. Colour too dark to be very attractive. Only fairly promising, though better in quality than most seedlings.

300. G. H. McMillan, Dunbar, Ont.—Medium size, yellow splashed and washed with purplish red; quality medium to above. Season mid to late winter.

301.—Samuel Greenfield, Ottawa East, Ont.—Above medium size; form roundish, conical, angular; cavity medium depth and width; stem short, slender; basin medium depth and width, wrinkled; calyx closed; colour yellow, almost entirely covered with deep crimson; dots moderately numerous, yellow, distinct; skin thick, tough; flesh yellow, moderately juicy, rather coarse; core medium; subacid, with a pleasant flavour; quality good; season evidently October and perhaps later.

Seedling originated by Mr. Greenfield. If this apple has better points than Wealthy it may be useful, but it is not as juicy nor as tender in the flesh as Wealthy, though perhaps a little higher flavoured.

302. Miss P. L. Baker, Oakville, Ont.—Size large; form roundish; cavity narrow, medium depth, lipped; stem short, slender; basin narrow, medium depth, almost smooth; calyx open; colour pale yellow, almost covered with crimson; dots obscure; skin thin, tender; flesh white; core medium; subacid, slightly astringent; quality good; season evidently late August to early September. Tree a seedling about ten years old. Blossomed for the first time this year. Blossoms very large. A handsome apple, resembling Red Astrachan very much in outward appearance, and probably a seedling of it. Resembles Langford Beauty and Russell in character of flesh and flavour.

303. E. Rakestrow, Township of Ryde, Muskoka District, Ont.—Above medium size; form oblate roundish; cavity deep, medium width, russeted; stem short, moderately stout; basin open, deep; calyx open; colour yellow, well washed with bright red; dots few, indistinct; skin thick, moderately tough; flesh yellowish, tender, juicy; core medium; subacid, sprightly, with a pleasant flavour; quality good; season evidently October. Tree quite hardy. Seed sown eight years ago by daughter of Mr. Rakestrow. had one apple in 1903 and fifty this year. Fourteen miles from Gravenhurst. A promising seedling. Not as high flavoured as Wealthy, but a good apple. Promising.

304. Thos. C. Paddon, 62 Bolton Avenue, Toronto.—Plum seedling; form broad oval; size above medium; cavity deep, narrow, abrupt; suture a distinct line, not depressed; apex rounded; colour dark, purplish red; dots numerous, small, yellow, distinct; bloom appears light; skin moderately thick, tough; flesh deep greenish yellow, juicy, firm; stone medium size, practically free; moderately sweet; quality medium to above. Tree said to be a seedling. 'Tree is an upright grower, stands about 25 feet high and is a good heavy cropper.' It resembles Lombard very much. Should be a good shipper. Domestica group.

305. E. Kenny, St. Vincent de Paul, Que.—Medium size; form roundish conical, angular; cavity medium depth and width, slightly russeted; stem medium length, slender; basin shallow, narrow, wrinkled; calyx partly open; colour yellow, well splashed and washed with rich red; dots moderately numerous, yellow and gray, distinct; skin moderately thick, tough; flesh crisp, tender, yellowish, juicy; core medium; briskly

subacid with a pleasant flavour; quality good; season late winter. Tree has been planted about 20 years. Fruit has large seeds. Said to keep until June. Resembles Rubicon somewhat. September 12, 1904, received 4 specimens of same apple from Mr. Kenny kept in an ordinary cellar. Still in condition for eating, but mildly subacid at this date. Evidently a good keeper.

306. Wm. Ogilvie, Ormstown, Que.—Size large; form oblate; cavity very deep, open; stem very short, stout; basin deep, medium width, almost smooth; calyx partly open; colour yellow, well splashed and washed with lively purplish red; dots few, large, gray, prominent; skin moderately thick, tough; flesh dull white, crisp, tender, juicy; core small; subacid, sprightly; quality good; season evidently early to mid-winter or later. A large handsome apple. Should make an excellent cooking apple, and is a good dessert variety also. Mr. Robert Brodie, Westmount, P. Q., received this apple from Wm. Ogilvie, Ormstown, Que., where it was grown. He thinks it may be a variety he used to call Hemmingford.

307. J. K. McKenzie, Rogers Hill, N.S.—Above medium size; yellow washed with bright red on sunny side; medium quality; season mid to late winter.

308-314. John McCarthy, Semiwagan Ridge, N.B.—Seven seedlings.

309. Seedling No. 2. Medium size; form roundish; cavity medium depth and width; stem broken; basin medium depth and width, almost smooth; calyx open; colour pale yellow well washed with crimson; dots few, small, pale yellow, indistinct; skin thick, tough; flesh white, juicy, tender; core medium; mildly subacid with a pleasant flavour; quality good to very good; season early winter. Resembles Fameuse very much. Evidently a seedling of it.

315. A. P. Stevenson, Nelson, Man.—Martha Crab seedling; size large; form roundish to oblate, conic, angular; cavity open, medium depth; stem medium length stout; basin narrow, medium depth, much wrinkled; calyx partly open; colour yellow, well splashed and washed with bright red; dots obscure; skin moderately thick, tender; flesh yellow, rather coarse, moderately juicy; core medium size, open; briskly subacid; quality medium; season evidently early September. A large, handsome apple which is said to have been grown from Martha Crab seed sent from the Experimental Farm, Ottawa, in 1896.

PLUMS.

Last winter was very hard on plums of the European and Japanese classes and most varieties were killed to the snow line. None of these plums have proven satisfactory here. There are, however, two seedlings of the Red June plum originated at the experimental farm which are hardier in the flower bud than any others which have been tested, and these bore some fruit this year. These have been called Togo and Oyama, and descriptions of them are given in this report. The crop of Americana and Nigra plums was the best we have ever had, both in quality and quantity, and the fruit sold well on the exchange here. Three American seedlings originated at the Central Experimental Farm were named this year, these being Gloria, Swift and Fitzroy. Descriptions of these follow. Among the newer Americana varieties which fruited this year the Admiral Schley, Bomberger, Lottie and Smith were the most promising. Descriptions of these are given also. One of our aims is to develop an

Americana plum with as tender a skin as the European, of good flavour and having a free stone. The nearest approach to this is the Welcome plum, originated at the Central Experimental Farm, and described in the report for 1903. Stones of this have been planted in the hope of getting an improvement in the next generation.

Togo (seedling of Red June).—Form roundish, somewhat heart-shaped; size above medium; cavity narrow, medium depth, abrupt; suture an indistinct, sometimes distinct, line, no depression; apex slightly flattened; colour deep red; dots numerous, small, indistinct; bloom moderate, bluish; skin moderately thick, tough; flesh yellow, firm, juicy; stone medium size, oval, slightly flattened, cling; sweet, acid next skin; quality good. A promising plum. Larger than Red June and better in quality. Handsome. Named Togo August 31, 1904, in honour of Admiral Togo. Triflora group.

Oyama (Botan seedling).—Form roundish to broad oval; size medium; cavity narrow, medium depth, abrupt; suture a distinct line, not depressed; apex rounded; colour deep red all over; dots obscure; bloom thin, pale bluish; skin moderately thick, moderately tender, bitter; flesh yellow, firm, juicy; stone small, oval, cling; sweet, not of rich flavour; quality, medium to above medium. Not specially promising. September 12, 1904. May be useful on account of hardiness of fruit buds. Triflora group.

Gloria (Wolf seedling).—Form oval to oblong, somewhat flattened; size large; cavity narrow, shallow, abrupt; suture a distinct line; apex rounded; colour uniformly bright red all over, or yellow mottled with red; dots few, yellow, small, distinct; bloom thin, bluish; skin thick, tough; flesh deep yellow, juicy; stone large, almost or quite free, oblong, considerably flattened; sweet; quality good. Owing to its large size and the almost freeness of stone, this is a promising variety. Americana group.

Swift (De Soto seedling).—Form broad oval, much flattened; size large; cavity narrow, shallow; suture merely an indistinct line; apex slightly flattened; colour yellow, mottled and washed with deep red; dots obscure; bloom slight; skin thick, moderately tough; flesh rather pale yellow, juicy; stone above medium, oval, semi-cling, almost free; flavour sweet, pleasant. A good plum and worth propagating. Americana group.

Fitzroy (Rollingstone seedling).—Form roundish, slightly heart-shaped, flattened; size above medium to large; cavity narrow, shallow, abrupt; suture a distinct line, no depression; apex rounded; colour yellow, well washed with deep red; dots numerous, small, yellow, distinct; bloom moderate; skin thick, moderately tender; flesh rather pale, yellow, juicy; stone above medium size, flattened, roundish to oval, practically free; sweet; quality good. A good plum, but cracks some, which may be against it. Freeness of stone a good point. Americana group.

Admiral Schley.—Form roundish; size very large; cavity narrow, shallow; suture a distinct line; apex rounded; colour yellow, well washed with deep bronzy red; dots numerous, small, yellow, distinct; bloom thin, bluish; skin moderately thick, tough; flesh deep yellow, juicy; stone large, oval, flat, cling; sweet, of a rich flavour; quality very good. One of the best Americana plums yet tested. An improvement over Hawkeye. Americana group.

Bomberger.—Form roundish to broad oval; size very large; cavity shallow, narrow; suture a distinct line; apex rounded; colour yellow, more or less covered with deep lively red; dots few, small, yellow, distinct; bloom medium; skin thick, tough; flesh deep yellow, juicy; stone medium size, oval, flat; sweet and rich; quality very good. A very handsome plum. More attractive than Hawkeye. Promising. Americana group.

Lottie.—Form roundish; size large; cavity shallow, narrow; suture an indistinct line; apex slightly flattened; colour yellow, mottled and washed with red; dots obscure; bloom slight; skin thick, tough; flesh sweet, juicy; stone medium size, roundish, semi-cling; sweet, rich; quality good. A handsome plum of good quality. Propagate. Americana group.

Smith.—Form roundish to broad oval; size large; cavity narrow, shallow; suture a distinct line; apex rounded; colour yellow, mottled and washed with red; dots obscure; bloom light; skin thick, moderately tough; flesh yellow, juicy; stone rather large, oval, nearly free; sweet, rich; quality good to very good. A good plum. Promising. Americana group.

GRAPES.

There was never a finer crop of grapes at the experimental farm than there was this year, but owing to the unusually cool and cloudy summer and autumn only 32 varieties ripened thoroughly compared with 101 in 1903. As the varieties which ripened this year are those which will mature with the least amount of heat, a list of them is herewith given as a guide to those who wish to test grapes in the colder parts of Canada. These are given in order of ripening. Florence, Early Daisy, September 9. Manito, Champion, September 17. Golden Drop, Jewel, Moore's Early, September 26. Moyer, September 27. Wyoming Red, September 28. Campbell's Early, Lincoln (Read's Hybrid), Brant, Canada, Telegraph, Hartford, Potter, Pattison, Seedling No. 1, X Muscat Hamburgh, Northern Muscadine, Dracut Amber, Maxatawny, September 29. Peabody, September 30. Janesville, Early Victor, Cottage, Lutie, October 3. Early Ohio, October 4. Creveling, Marion, Jessica, Superb, October 6. Belvidere, October 8. Delaware, Lindley, Brighton, Moore's Diamond had some bunches about ripe October 6.

The following new variety is described for the first time in this report.

Lincoln (Read's Hybrid).—Concord female X Black Hamburgh male. In 1897 three vines of this grape were sent for test by Mr. M. A. Read, Port Dalhousie, Ont., son of Wm. H. Read, the originator.

This variety has proven so valuable here, and should prove so valuable even in the best grape districts, that it deserves especial mention. The vine is a vigorous grower and very productive. The bunches are below medium size, but well filled, from 4 to 5 inches in length, compact, cylindrical or slightly shouldered. Fruit below medium size, round, black with a moderate bloom. Skin thick, tough; pulp moderately firm, but breaks fairly easily. Sweet, sprightly, slightly foxy; flavour somewhat like Concord with a suggestion of Black Hamburgh. Quality almost good. This is attractive in appearaace and ripens about the same time as Moore's Early and would probably make a good shipping grape. Very promising.

In a letter received from Mr. M. A. Read, Port Dalhousie, Ont., dated December 1, 1904, further information was obtained regarding this variety. He writes:—

'The Black Hybrid grape received by your department in the year 1897 was originated by my father, the late Wm. H. Read, in the year 1887. It is a cross between the Concord and Black Hamburgh; Concord for female and Hamburgh for male. The original vine stood the test equally as well as the Concord thus far and is much more prolific, very compact, well shouldered bunch, berry medium size and of good quality, ripens about with Champion or Moore's Early, and a vigorous grower. This variety has taken first premium wherever exhibited and a special award of a silver medal at the Pan-American Exhibition, Buffalo, on its merits.'

BUSH FRUITS.

The raspberry, currant and gooseberry crops were all good this year. The Herbert raspberry continues to be the best main crop red variety tested here. The Brighton and Count are two hardy and very productive seedlings of Dr. Wm. Saunders, but are not equal to the Herbert in size or quality. The Sarah, another of Dr. Saunders' seedlings, is the finest in quality, but the colour is rather dark and it is not productive enough. Heebner and Clarke, resembling each other very much, are two desirable varieties for home use, being hardy, productive and of good quality. Cuthbert is too tender for this district.

The blackberry crop was a failure here this year.

STRAWBERRIES.

The strawberry crop was somewhat lighter than usual this year, not owing to unfavourable weather this season, but on account of the protracted drought in 1903, which delayed planting until June 15. Being planted so late, fewer runners were formed than usual, hence the crop was less. The plants came through the winter well, being practically uninjured.

For general purposes, the following varieties have proven among the most satisfactory, after a number of years' tests : Sample, P., Buster, P., Bisel, P., Glen Mary, B., Greenville, P., Beder Wood, B., Marie, P., Warfield, P., Enhance, B., Howard's 41, P., Barton's Eclipse, P., Thompson's Late, P. In addition to these are William's B., for shipping long distances and Bubach, P., for near market or home use. Lovett, B., is also a good, perfect berry for general purposes and for home use. Daisy is very handsome and productive, but soft. Afton, Steven's Early and Daniel Boone all resemble Warfield so much that they cannot be distinguished from it. Among the newer varieties which fruited this year for the first time, the following are considered promising :—

Pocomoke, B.—This was the most productive variety in the plantation this year, size large to very large; form obtusely conical; colour, bright glossy red but inclined to have white tip; very firm; flesh juicy, briskly subacid; quality above medium. Season medium to late. Plant a vigorous grower with good foliage. Quite promising as a productive berry for long shipment.

Lyon, P.—Size medium to above medium; form long, pointed or wedge-conical; colour deep red; moderately firm; flesh juicy, briskly subacid, pleasant flavour; quality good. Season early to medium. Plant a vigorous grower, with good foliage. A productive variety which this year ripened a good deal of fruit early.

Early Beauty, P.—Size medium to above medium; form roundish; colour deep glossy red; moderately firm; flesh juicy, briskly subacid; quality above medium. Season very early. Plant a vigorous grower, with healthy and abundant foliage. One of the most promising early varieties.

Splendid.—This variety was grown for a number of years and then discarded, but is being given a further test with a new strain. It is a very productive variety but is soft and not attractive in colour.

In the following table will be found a list of fifty varieties of strawberries arranged in their order of merit or rank, from the average of two to four years' test. Most of these have been tested for four years, namely, 1900, 1901, 1902, 1904. The crop was practically a failure in 1903. Their rank for the year 1904 is also given in the table, as well as other information. In addition to the list of fifty varieties, a short list of twelve follows, representing the best yielding varieties fruiting for one year only. There were 196 named varieties under test this year, and 53 unnamed seedlings. In the tables B. stands for bi-sexual or perfect, while P. stands for pistillate or imperfect :—

MOST productive 50 varieties of Strawberries for an average of from 2 to 4 years.

Average Rank.	Number of years averaged.	Rank, 1904.	Name.		Date of full bloom, 1904.	Date of first ripe fruit, 1904.	Date of first picking, 1904.	Date of last picking, 1904.	Number of pickings, 1904.	Weight of 25 average berries, 1904.	Total yield, 1904.		Average total yield.	
										Oz.	Lbs.	Oz.	Lbs.	Oz.
1	3	84	Mele	P..	May 19	June 20	June 18	July 18	11	5	7	6¾	24	13⅓
2	4	9	Sample	P..	June 4	" 19	" 22	" 18	10	6½	17	4¾	22	13⅓
3	4	85	Buster	P..	" 2	" 20	" 22	" 15	9	7	7	4¾	22	2⅓
4	4	5	Bisel	P..	" 2	" 19	" 22	" 18	10	7¼	18	11½	21	12
5	4	23	Afton	P..	May 30	" 17	" 20	" 18	11	5½	13	5¼	21	8⅓
6	4	29	Steven's Early	P..	June 2	" 17	" 18	" 15	10	6¼	12	14¼	20	14
7	4	14	Glen Mary	B..	" 2	" 19	" 22	" 15	9	7¾	15	15	20	14
8	4	94	Daisy	P..	" 6	" 20	" 22	" 15	9	6	6	14¾	20	10
9	4	40	Greenville	P..	May 21	" 17	" 20	" 15	10	7	11	5	20	4½
10	4	11	Daniel Boone	P..	June 2	" 18	" 20	" 18	11	7	16	6¾	20	00
11	4	60	Howard's 41	P..	May 25	" 19	" 22	" 18	10	6	9	3½	19	12
12	4	34	Enhance	B..	" 30	" 22	" 24	" 18	9	8	11	15¼	19	7¾
13	4	54	Warfield	P..	" 28	" 17	" 18	" 18	12	5	9	11½	18	12
14	2	36	Marie	P..	June 2	" 17	" 18	" 18	12	7	11	9¾	18	3½
15	4	12	Beder Wood	B..	May 29	" 18	" 20	" 15	10	6	16	6	18	2
16	4	50	Carleton	P..	June 2	" 20	" 22	" 18	10	5½	9	14	17	15½
17	3	44	Cole's Seedling	B..	" 5	" 25	" 27	" 18	9	6½	10	14½	17	13½
18	4	25	Barton's Eclipse	P..	" 2	" 18	" 20	" 18	11	6½	13	3¾	17	13½
19	4	20	Hattie Warfield	P..	May 29	" 16	" 18	" 18	12	5¾	14	5½	17	11½
20	4	102	Thompson's Late	P..	June 4	" 21	" 22	" 18	9	6	6	8¾	17	7
21	4	110	Dora	P..	" 2	" 18	" 20	" 18	11	5½	6	1½	17	7
22	4	45	Maggie	P..	" 2	" 17	" 18	" 18	12	5½	10	13	17	5¾
23	4	16	Bubach	P..	" 4	" 19	" 22	" 18	12	7	15	10½	16	12¾
24	4	8	Swindle	P..	May 29	" 21	" 22	" 18	11	6½	17	6½	16	12½
25	4	72	No Name	B..	June 2	" 20	" 22	" 18	10	5½	8	1¾	16	8
26	4	7	Crescent	P..	May 29	" 18	" 20	" 18	11	5¼	17	12½	16	5½
27	4	10	John Little	P..	June 2	" 19	" 20	" 18	11	5	17	0¾	16	4¾
28	4	125	Wonderful	P..	" 2	" 18	" 20	" 15	10	6¼	4	14	16	2¾
29	4	96	Williams	B..	May 28	" 20	" 22	" 15	9	6	6	14	15	14
30	4	22	Clyde	B..	" 30	" 19	" 22	" 18	10	8	13	5½	15	12⅓
31	4	78	Arkansas Traveller	B..	June 4	" 22	" 24	" 18	9	6½	7	9½	15	11
32	4	66	Parker Earle	B..	May 29	" 16	" 18	" 18	12	6	8	12¼	15	7¼
33	4	68	Carrie	P..	June 4	" 24	" 27	" 18	9	7½	8	7	15	7¼
34	4	39	Bomba	P..	May 30	" 18	" 20	" 15	9	6	11	5½	15	3¼
35	4	46	World's Champion	B..	June 5	" 20	" 24	" 18	9	6½	10	11½	15	2
36	4	114	G. H. Caughell	B..	May 25	" 16	" 18	" 15	11	4½	5	11¾	14	12¼
37	4	124	Dr. Arp	P..	" 29	" 18	" 20	" 18	11	...	4	14¾	14	9¼
38	4	32	Tennessee Prolific	B..	" 30	" 19	" 22	" 15	9	7	12	6¾	14	6¾
39	4	83	Lovett	B..	June 4	" 18	" 20	" 18	10	5¼	7	7	13	15
40	4	113	Cyclone	P..	" 2	" 19	" 22	" 18	9	5½	5	12½	13	15
41	3	31	Senator Dunlap	B..	May 29	" 16	" 18	" 18	12	6½	12	10¾	13	13¼
42	4	89	Kyle	B..	June 2	" 20	" 24	" 15	8	5¾	7	1	13	6¼
43	4	70	Enormous	P..	May 27	" 20	" 22	" 15	9	8¼	8	2½	13	4
44	4	26	Anna Forest	P..	June 2	" 18	" 20	" 11	9	5¼	13	0¾	13	3¼
45	4	57	Hood River	P..	" 4	" 20	" 22	" 18	11	6½	9	8¾	13	2¼
46	4	6	Boynton	P..	" 2	" 17	" 18	" 15	12	4¾	18	0¼	12	1⅔
47	4	117	Brandywine	B..	" 4	" 23	" 24	" 18	8	6¾	5	9	12	15
48	4	43	Wm. Belt	B..	" 2	" 21	" 22	" 15	8	6½	11	0	12	7¼
49	4	104	Satisfaction	B..	" 4	" 20	" 22	" 18	10	5	6	6	12	7¼
50	4	64	Morgan's Favorite	B..	" 2	" 23	" 24	" 15	9	.....	8	13¾	12	6¾

MOST productive 12 varieties fruited for one year.

Average Rank.	Number of years averaged.	Rank, 1904.	Name.		Date of full bloom, 1904.	Date of first ripe fruit, 1904.	Date of first picking, 1904.	Date of last picking, 1904.	Number of pickings, 1904.	Weight of 25 average berries, 1904.	Total yield, 1904.		Average total yield.
....	....	1	Pocomoke	B..	June 2	June 22	June 24	July 15	9	7	22	2	....
....	....	2	Lyon	P..	" 2	" 20	" 22	" 18	11	7	20	13¾	....
....	....	3	Warfield (Kellogg)	P..	May 28	" 17	" 18	" 18	12	5½	19	14½	....
....	....	4	Splendid (new strain)	B..	June 2	" 20	" 22	" 18	10	6	19	14¼	....
....	....	15	Early Beauty	B..	May 29	" 15	" 18	" 6	9	5	15	12½	....
....	....	28	Suceess	B..	June 4	" 20	" 22	" 18	11	6½	12	15	....
....	....	30	Tilgman	P..	" 6	" 24	" 27	" 18	9	...	12	13	....
....	....	56	Superior	B..	May 25	" 16	" 18	" 8	10	5	9	8¾	....
....	....	63	Monitor	B..	June 2	" 18	" 20	" 15	10	6½	9	0½	....
....	....	71	Big Bobs	B..	" 4	" 22	" 24	" 15	10	8	8	1¾	....
....	....	75	Minute Man	P..	" 2	" 18	" 20	" 18	12	6	7	10½	....
....	....	82	Latest		" 6	" 24	" 27	" 18	9	7	7	7½	....

FUNGOUS DISEASES.

With the exception of the Black Rot of the grape, fungous diseases were not unusually prevalent this year. Owing doubtless to the almost entire absence of Black Spot of the apple in 1903 in eastern Ontario and the province of Quebec, there was much less spot this year than usual, although some unsprayed orchards were badly affected. In western Ontario, however, the spot was about as bad as usual in unsprayed orchards, while in orchards well sprayed the fruit was clean. As the plum crop was almost a complete failure, the Ripe Rot was not bad, but grapes suffered to such an extent with Black Rot that growers have become alarmed, and for this reason some space is devoted to diseases of the grape in the report this year.

DISEASES OF THE GRAPE IN ONTARIO VINEYARDS IN 1904.

Knowing that rot was causing serious damage in a number of vineyards in the Niagara peninsula, I took the opportunity on September 13 and 14, of visiting some of them in the hope of learning something that would prove suggestive in fighting the diseases of the grape and of obtaining other information that would be useful to fruit growers regarding the different kinds of rot which were causing loss. On September 13, accompanied by Mr. W. H. Bunting, of St. Catharines, Ont., I visited his vineyard and others in the neighbourhood of St. Catharines. Mr. Bunting had sprayed seven times and his fruit was only slightly injured. He had bagged 1,000 bunches when the grapes were the size of peas in order to find out if infection took place before that time. Most of the bunches thus bagged were perfect, but some had the Black Rot in various stages of development, showing that infection had taken place before the grapes were as large as peas. The Niagara grape was the variety most affected in Mr. Bunting's vineyard. Several vineyards of Concord near Mr. Bunting's were examined, but Black Rot had not worked to any extent in them. Brown Rot was, however, found in one vineyard, but it had not done much injury to the fruit. Another vineyard, probably of about fifteen acres, was visited, consisting principally of Concord, Brighton, Niagara and Moore's Early. Of Niagara and Brighton there was scarcely a sound grape anywhere, and none of the bunches of Concord even with manipulation could be made fit for market. Moore's Early was not affected. This vineyard had not been sprayed.

The infection by the Black Rot as it appeared in the vicinity of St. Catharines was first noticed on the fruit as a round, brownish coloured spot about the size of the head of a pin. This brownish appearance gradually spread over the surface of the berry and by the time one-third of the surface was covered in this way the original brown spot had become paler, showing distinctly the mark of infection. After the whole grape became brown, the tissue gradually shrunk and dried and when thus shrunken the fruit appeared black and prominently and irregularly ridged, the surface being covered by small black pustules. On September 14, I visited the vineyards of Mr. Murray Pettit, Winona, Ont., and other vineyards in that vicinity. No Black Rot was noticed at Winona, but Brown Rot was quite abundant, and while it had not caused such damage as the Black Rot, it had done considerable injury. The leaves of the vines affected with Brown Rot had a velvety or downy appearance underneath. The affected fruit first showed a brownish spot or patch one one side and a shrinking of the tissue. This brownish appearance spread all over the grape and the whole grape eventually shrunk into a hard shrivelled mass. When badly affected the vine looses a large amount of foliage. Powdery mildew was also found in these vineyards.

The Niagara grapes, both in Mr. Pettit's and adjoining vineyards, were affected this year with either a new disease or more probably, as Prof. Selby suggests, a condition caused by either Powdery Mildew or Brown Rot affecting the stem to which the grape is attached. This disease caused a hardening of the grape and gave it a pale, unhealthy colour.

Another disease of the grape which was doing a great deal of injury at Winona was what we took to be the Grape-leaf Blight, a disease which has not received the attention which it deserves. This blight causes the leaves to wither and drop, thus preventing a free circulation of sap and the proper development and maturing of the fruit.

The diseases of the grape can be controlled by thorough spraying, but the work must be done persistently and carefully.

FUNGOUS DISEASES OF THE GRAPE.

Anthracnose: Bird's Eye Rot: Scab (*Sphaceloma Ampelinum*).—This is the only grape disease which has given any trouble at the Central Experimental Farm. It is difficult to control by spraying, but, fortunately, only a few varieties have been affected, Lindley being the worst. This fungus attacks leaves, stems, and fruit, but it is on the fruit where it is most noticed. The disease is apparent in depressed patches extending along the stems, which checks the growth. There are also reddish brown patches on the leaves. The stems of the clusters of grapes are frequently affected, and when the disease occurs there the fruit remains green and eventually withers, making an imperfect bunch. The disease on the fruit occurs in roundish brown depressed spots with a purplish margin, giving somewhat the appearance of a bird's eye. Frequently spots unite and form a large irregular area. This is a very difficult disease to control, and thorough spraying with Bordeaux mixture has not checked it to any extent. Spraying before the buds open; before blossoming; after fruit has set and ten days later with Bordeaux mixture is recommended.

Black Rot (*Laestadia Bidwellii*).—Up to quite recent years this disease was thought to have reached its northern limit, south of lakes Erie and Ontario, but during the last few years in Essex county, and more recently in the Niagara peninsula, it has caused much damage. The appearance of this disease has already been described, but something further must be said regarding it. The spores live over winter on the vines and in the affected grapes, and germinate when growth starts in the spring. The disease attacks the leaves and young shoots, the leaves showing the disease in roundish reddish brown patches, and on the stems it appears in small, long shaped, dark brown, slightly depressed spots, on the surface of which appears the characteristic pustules of the Black Rot. When conditions are favourable, the disease only requires from 8 to 12 days from the time the spore germinates until the mycelium has run its course through the fruit and has produced new spores. Before the grape shrinks much in size the mycelium concentrates, as it were, in small masses underneath the skin, and in these are produced the spores. These masses soon break through the skin and the black pustules with the spores appear. The spores are scattered and they reinfect other fruits and vines. Although it is possible for a new generation of spores to be borne within two weeks, it requires favourable weather conditions for the disease to develop. While early sprayings have in some cases not been found to give the results expected, the life history of the disease shows that it must be wise to endeavour to destroy as many spores as possible at or before the first infection. The first spraying should be made just before blossoming, the second just after the fruit has set, the third and fourth at intervals of about a week—all with ordinary Bordeaux mixture. There should then be three sprayings with Ammoniacal Copper Carbonate or Soda Bordeaux, which will not discolour the fruit to any extent. Although the disease will probably not be eradicated from a vineyard in one season, the more thoroughly the spraying is done the less trouble there should be. It is now sixteen years since it was conclusively shown that Bordeaux mixture would control this disease.

Brown Rot: Downy Mildew: Gray Rot (*Peronospora viticola*).—This is the rot which up to quite recent years proved most injurious in Ontario. The general appearance of this rot as it affects the fruit has already been noticed. Like the Black

Rot, it affects leaves, stems, and fruit. The disease causes slightly depressed patches on the shoots, somewhat like Anthracnose, but are not so deep. The stems, however, are not usually badly affected, but it is the leaves and fruit which suffer most. Unlike the Black Rot, in which the mycelium does not extend far into the tissue of the plant, in the case of Brown Rot once an infection takes place the disease spreads through the tissues of the vine; and when the leaves are affected they turn pale where the disease has been at work, and about this time the under part of the affected part of the leaf becomes downy, indicating the presence of spores and presenting the 'Downy Mildew' stage of the disease. After this the affected parts of the leaves turn brown. As previously stated, the diseased condition of the fruit is indicated by a brown patch which spreads over the whole grape, which gradually withers. The absence of black pustules readily distinguish this at this stage from the Black Rot. Sometimes after the fruit has withered it becomes covered with a white powdery substance, indicating the spores, but these do not always develop. Treatment.—Spray with Bordeaux mixture just before blossoming, after fruit has set, and ten to fourteen days later.

Powdery Mildew (*Uncinula spiralis*).—This disease does not penetrate into the tissue of the plant as the Black and Brown Rot, but grows upon the surface, making it much easier as the Black and Brown Rot, also, it spreads more rapidly in rather dry weather. The mildew grows on the young shoots and upper surface of the leaves and on the fruit, giving them a grayish, powdery appearance easily recognized as being caused by the Powdery Mildew. This disease feeds on the plant by sending small suckers into the plant cells from which it gets food. Spores are produced early in the season and these being scattered about soon infect other leaves or vines and spread the disease. A second crop of spores is produced later in the summer and these carry the disease over the winter. These are enclosed in a hard, roundish case which becomes black during the latter part of the season. Treatment.—This is a very easy disease to treat and yields readily to fungicides. Dry sulphur and sulphur and water have been found effective, but as this disease often accompanies other diseases of the grape, the sprayings with Bordeaux mixture recommended for Black and Brown Rot are preferable and will effectually check it.

Ripe Rot.—A species of ripe rot has affected a few varieties at the Central Experimental Farm, Salem and Peabody being two of the most affected. The fruit is quite plump and juicy up to the last, but about the time of ripening, the fruit turns brownish at the affected part and often bursts.

Grape Leaf Blight (*Cladosporium viticolum*).—A disease noticed in the vineyards at Winona, Ont., is undoubtedly this species. It causes a withering of the leaves somewhat like the Brown Rot, but the fruit is not affected nor has the under surface of the leaf the downy appearance of the Brown Rot. The leaves on the vines at Winona had the burnt appearance which is peculiar to many leaf blights. The patches on the leaves indicating the disease, are large and irregular in outline. These patches become quite dry and will break from the leaf very easily. The spores are borne on the under surface of the leaf on slender filaments and are produced in large numbers during damp weather. This disease lives over the winter in the fallen leaves. It has not received very much attention but it weakens the vines and prevents the full development of the fruit. Spraying the vines, as for Black Rot, should prove quite effectual with this disease.

COVER CROPS.

English Horse Beans and Rape.—In the report for 1903, experiments in the use of the English Horse Bean and Hairy Vetch were described. It was shown that Horse Beans and Hairy Vetch sown in rows 28 inches apart had given very satisfactory

results. These were sown in this way because it is sometimes difficult to get a good 'stand' for a cover crop in the autumn by sowing about the middle of July and later, owing to the dry weather which often occurs after seeding, delaying the germination of the seed, and in the north it is very desirable to have the cover crop tall so that it will hold the snow. By sowing the seed in rows it can be sown comparatively early and the soil cultivated between the rows when the plants come up, thus conserving moisture and making sure of a good cover crop. Cultivation may be discontinued about the middle of July or a little later. The Horse Beans sown on June 18, 1903, were from 3 feet 6 inches to 4 feet in height on September 21, and it was estimated that the green crop per acre was 7 tons 733 pounds above ground and 2 tons 852 pounds of roots, or a total of 9 tons 1,585 pounds per acre, containing according to the figures given by Mr. Frank T. Shutt, Chemist of the Experimental Farms, in his report for 1903, 78 pounds of nitrogen as compared with 130 pounds from Mammoth Red Clover, and 147 pounds from Hairy Vetch. These beans stood up well all winter, holding the snow admirably, and by spring were still 2 to 2½ feet in height. A land roller was put on as soon as the soil was in condition to work, and the beans were rolled down. The disc harrow was then used and it was found that they broke up readily; they were then cultivated in with a spring tooth cultivator. Owing to the coarse nature of the stems they were noticed in the soil longer than clover or vetch, but in a comparatively short time they decayed and gave practically no trouble. Horse beans were again sown in drills this year on June 16, and were 3 feet 5 inches in height when frozen. The advantage of Horse Beans is that they winter kill and are easily worked under in the spring, while Hairy Vetch and Clover are more difficult to deal with, and if left until late in the spring will take considerable moisture from the soil. The disadvantage of the Horse Bean is that there is no mat of vegetation close to the soil, and if there should be a winter without snow it might not prove as effective as Red Clover or Hairy Vetch. In order to ensure a mat of vegetation which would cover the ground in winter and which would be dead in the spring, rape was used in one part of the orchard and it is believed that English Horse beans and rape grown together will prove one of the most satisfactory cover crops where they will succeed. The Horse beans will furnish nitrogen and humus and will hold the snow well. The rape will cover the ground, thus protecting the roots, and will also add humus. At Ottawa, Horse beans sown during the last week of June at the rate of one bushel per acre in drills 28 inches apart and cultivated two or three times, and rape sown broadcast between the rows during the latter half of August should furnish a very satsfactory combination. Both English Horse beans and rape are moisture-loving plants and will not succeed as well in dry soils as they will where there is a fair amount of moisture Where the Hairy Vetch is grown for seed, Horse beans sown in drills at the same time as the vetch should prove very useful the following season in holding up the vines, thus insuring a larger crop of seed. At our suggestion, one grower tried it this year and is favourably impressed with this method.

Hairy Vetch.—The Hairy Vetch was used quite largely in the orchards at the Central Experimental Farm in 1903, and was sown again this year, both alone and broadcast and also with Horse Beans to form a mat on the ground, and has been found satisfactory for this purpose, but owing to the difficulty of ploughing under, rape would appear to be more suitable. The Hairy Vetch is a very rapid grower and will continue to grow until almost winter, as light frosts have apparently little effect upon it. It forms a thick mat on the ground, making a perfect mulch and an ideal cover for preventing the thawing and freezing of the ground and protecting the roots of the trees. It will not hold the snow as well as the taller plants, but will probably be found as a rule satisfactory enough in that respect. It is quite rich in nitrogen, being more so than the Mammoth Red or Common Red clovers. The great disadvantage of the Hairy Vetch is the difficulty in ploughing it under where it lives over the winter. Sown broadcast, from 30 to 40 lbs. per acre is

sufficient to give a good stand under favourable conditions, and 20 lbs. per acre has been found sufficient when sown in rows. It was not winter killed at the Central Experimental Farm last winter and soon began to make rapid growth in the spring. On June 2 it was cut, with the object of mulching the ground with the crop, the plan being to cut at intervals throughout the summer as with Red clover and use each cutting as a mulch. The vetch, however, was killed by the first cutting. It was thus not found satisfactory as a crop for mulching. Mammoth Red and Common Red clover sown broadcast at the rate of 10 or 12 pounds per acre about the middle of July proves very satisfactory as cover crops in those sections, such as eastern Ontario, where they make good growth in the autumn. Ploughed under in the spring, Red clover adds much plant food and humus to the soil, and in orchards where there is usually an abundance of moisture, such as the orchard at the Central Experimental Farm, it has been found quite satisfactory to cut the clover several times during the summer instead of ploughing it under in the spring, leaving the green crop as a mulch on the ground.

CONSERVATION OF MOISTURE.

As the conservation of moisture is one of the chief reasons for the cultivation of orchards in the summer, any method which will bring about as good results as cultivation without going to the expense and trouble would be very acceptable. It is claimed for the so-called mulch method, by which the grass grown in an orchard in sod is used about the trees to conserve moisture, that the results obtained are quite as satisfactory as with clean cultivation, but it has been found in certain cases that where such good results have been obtained the soil is naturally moist. This year an experiment was planned in conjunction with Mr. F. T. Shutt, Chemist, to determine if there were any crops which would conserve, by the mat they formed on the ground, almost or quite as much moisture as they transpired through their leaves. The extremely cool wet season was unfavourable for this work, but the results of the test will be found in Mr. Shutt's report.

VEGETABLES.

Experiments with vegetables were continued this year, but the list of varieties was cut down very considerably, as sufficient information has now been obtained of a great many of them to warrant discarding them. Those that are recommended are tested each year for comparison with the newer kinds which are being constantly offered for sale. The season was favourable for all vegetables except those which required much heat, such as melons, peppers, and tomatoes, and the crop of these was much less than usual. Cutworms were very bad and injured the test of pease so much that this season's results are worthless. Bran and Paris green in the proportion of 1 lb. Paris green to 50 lbs. bran has been found to be the best remedy for cutworms yet tried, as if applied in time the cutworms will aparently eat it in preference to living plants.

Selection of Pease and Beans.—During the past five years an experiment has been in progress in selecting garden pease to develope, if possible, earlier and more productive strains. The results are very encouraging and the effect of selection in regard to increase of yield and earliness is quite marked in some cases. A similar experiment has been carried on with beans for four years, and more recently with tomatoes and melons. There is a wide field for work of this kind, especially in this climate, where earliness is such an important factor in determining the profits from vegetables.

Further experiments in growing vegetables in a cheese-cloth inclosure.—The experiment begun and reported on last year of growing vegetables in a cheesecloth in-

closure was continued this year with results confirming those of last year in some respects, while in others owing to the extremely cool, cloudy season the difference in favour of cheesecloth was not so marked, and in some cases vegetables which had done better in 1903 inside than out, this year did better outside than in. Radish, cauliflower, lettuce, beans, and onions were tested this year. It was again found that radish and cauliflower grown inside the inclosure were free of maggots except in an occasional instance in the case of the cauliflower where the plants had evidently been affected in the hot-bed before setting out in the inclosure. This preventative of root maggots should be more widely utilized, especially among amateurs, where these insects are troublesome. Both radish and cauliflower develope very satisfactorily in the inclosure. In 1903 radish was ready for use inside the inclosure three days earlier than outside, this year radishes were two days later than outside, but the radishes remained fit for use nearly a week longer inside than out, the radishes, when they had reached a large size, being still crisp and tender. Whether it would pay commercially or not is still doubtful. The cauliflower outside was practically a failure, inside it was quite satisfactory. Lettuce was ready for use in 1903 in the inclosure two to four days later than outside; this year it was ready two days earlier inside. Beans were ready for use in 1903 in the inclosure three days sooner than outside, and the yield was 14 quarts outside and 11 quarts inside. This year the beans were ready for use inside one to two days later than outside, the yield inside being 58 quarts, while outside it was 53 quarts. There was no apparent difference between the onions planted outside and inside.

The cheesecloth used in 1903 was used again this year, but it tore considerably during the latter part of the season, and gave trouble. Two years is the longest time that this cheesecloth, which cost 5 cents a yard, may be expected to last.

POTATOES.

The season of 1904 was favourable to the potato crop at the Central Experimental Farm, as the blight did not appear until late, and there was little rot in the field. The yields of 73 varieties are published in the following table, all grown in the same sized plots. The Vermont Gold Coin, which was tested for the first time in 1903, headed the list this year, yielding at the rate of 554 bushels 24 pounds per acre. This is a very promising variety. Between this variety and the lowest yielder, the Early Andes, which only yielded at the rate of 123 bushels 12 pounds per acre, there is a difference of 431 bushels 12 pounds per acre, which is more than three times the average yield per acre for the province of Ontario, striking evidence of the importance of planting only the most productive varieties.

The soil in which the potatoes were planted was good sandy loam, the previous crop being strawberries. The soil was given a heavy dressing of barnyard manure for the strawberries in the spring of 1902, but had not received any since. The land was ploughed in the summer of 1903, and again in the spring of 1904, and thoroughly harrowed with the disc and smoothing harrows shortly before planting. The drills, which were 2½ feet apart, were made with the double mould board plough and were about 4 inches deep. The sets were of good size, having at least three eyes, it having been found that, taking one year with another, this is the best kind to use. There were 66 sets of each variety planted 1 foot apart in a single row. The sets were covered with the hoe to ensure more uniform conditions. Level cultivation was adopted and the potatoes were cultivated four times, and sprayed four times with Bordeaux mixture.

TWELVE BEST YIELDING POTATOES—AVERAGE OF FIVE YEARS, 1900–4.

Name of Variety.	Season.	Colour.	Quality.	Average Yield per Acre, 1900 to 1904.	
				Bush.	Lbs.
1. Dr. Maercher	Very late	White	Med. to good	496	19
2. Late Puritan	Medium	"	Good	485	19
*3. Burnaby Mammoth	"	Pink and white	"	483	34
4. Money Maker	"	White	"	482	41
5. Carman No. 1	Medium	White	"	459	48
6. Dreer's Standard	"	"	"	458	55
7. Sabean's Elephant	"	"	"	454	58
8. Canadian Beauty	"	Pink and white	"	452	46
9. Rural Blush	Late	Pink	"	437	48
10. I.X.L	Medium	Pink and white	"	433	50
11. Pearce	"	Pink and white,	Good	433	24
12. Clay Rose	"	Pink	Medium	432	58

* This variety was first grown under the name of Burnaby Seedling, and then procured under the name of Burnaby Mammoth. The average yield from the older strain for four years, and the new one for one year is 469 bushels 29 lbs.

POTATOES—TEST OF VARIETIES.

No.	Name of Variety.	Season.	Quality.	Total Yield per Acre.		Yield Per Acre, Market-able.		Yield Per Acre of Unmarketable.		Colour.
				Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Vermont Gold Coin	Medium	Good	554	24	475	12	79	12	White.
2	Morgan's Seedling	"	"	514	48	413	36	101	12	Pink and white.
3	Carman No. 1 (new seed)	"	"	501	36	409	12	92	24	White.
4	Dr. Maercher	Late	Medium	501	36	382	48	118	48	"
5	Dooley	Medium	Good	479	36	409	12	70	24	"
6	Rural Blush	Late	"	479	36	391	36	88	0	Pink.
7	White Elephant	Medium	"	466	24	409	12	57	12	" and white.
8	Burnaby Mammoth	"	"	462	0	396	0	66	0	" "
9	Quick Crop	Early	"	448	48	382	48	66	0	" "
10	Northern Beauty	"	"	440	0	356	24	83	36	"
11	Carman No. 3 (new seed)	Late	"	435	36	391	36	44	0	White.
12	Holborn Abundance	"	Medium	435	36	369	36	66	0	"
13	Carman No. 1	Medium	Good	435	36	330	0	105	36	"
14	American Giant	"	Medium	431	12	365	12	66	0	"
15	Doherty's Seedling	"	Good	431	12	356	24	74	48	"
16	Early Carter	Early	"	426	48	334	24	92	24	"
17	Money Maker	Medium	"	418	0	347	36	70	24	"
18	Reeve's Rose	Early	"	404	48	343	12	61	36	Pink.
19	Montana Bluff	Medium	"	404	48	334	24	70	24	White.
20	Mammoth Pearl	"	"	400	24	334	24	66	0	"
21	Clark's Pride	..	....	400	24	286	0	114	24	"
22	Clay Rose	Late	Medium	391	36	338	48	52	48	Pink.
23	Crines Lightning	Early	Good	391	36	334	24	57	12	Red, brighter in eye.
24	Everett	"	"	387	12	316	48	70	24	Pink.
25	Rose No. 9	Late	Medium	382	48	356	24	26	24	"
26	Vick's Extra Early	Early	Good	378	24	325	36	52	48	" and white.
27	Pearce	Medium	"	378	24	321	12	57	12	" "
28	Penn Manor	Early	"	374	0	334	24	39	36	" "
29	Rochester Rose	"	"	374	0	281	36	92	24	"
30	Napoleon	"	"	369	36	272	48	96	48	"
31	Canadian Beauty	Medium	"	365	12	321	12	44	0	" and white.
32	Van Orman's Earliest	Early	....	365	12	308	0	57	12	"
33	Sabean's Elephant	Late	Good	365	12	303	36	61	36	White.
34	I. X. L.	"	"	365	12	294	48	70	24	Pink and white.
35	Jubilee	Medium	"	365	12	286	0	79	12	" "
36	John Bull	....	....	360	48	316	48	44	0	"
37	Empire State	Medium	Good	360	48	299	12	61	36	White.
38	Peck's Early	Early	....	360	48	294	48	66	0	Pink.

POTATOES—TEST OF VARIETIES—*Concluded.*

No.	Name of Variety.	Season.	Quality.	Total Yield per Acre.		Yield Per Acre, Market-able.		Yield Per Acre of Unmar-ketable.		Colour.
				Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
39	Dreer's Standard	Late	Good	356	24	299	12	57	12	White.
40	Flemish Beauty	Medium	"	347	56	286	0	61	36	Bright pink.
41	Late Puritan	Late	"	343	12	290	24	52	48	White.
42	Early Rose	Early	"	343	12	277	12	66	0	Pink,
43	Morgan's White	Medium		343	12	272	48	70	24	White.
44	Eureka Extra Early	E. early		338	48	281	36	57	12	"
45	Swiss Snowflake	Late	Good	334	24	272	48	61	36	"
46	Rawdon Rose	Early		334	24	268	24	66	0	Pink and white.
47	Early Ohio	E. early	Good	330	0	264	0	66	0	"
48	Rough Coat Cup			325	36	220	0	105	36	"
49	Early Elkinah	Early	Good	316	48	237	36	79	12	"
50	Uncle Sam	Medium	"	312	24	228	48	83	36	White.
51	Nott's Peachblow	Late		312	24	220	0	92	24	Pale pink, red in eye.
52	Enormous	"	Good	308	0	255	12	52	48	White.
53	American Wonder	"	"	308	0	246	24	61	36	"
54	Wonderful	Medium		308	0	246	24	101	12	Yellowish.
55	Vick's No. 9			299	12	255	12	44	0	White.
56	State of Maine	Late	Good	299	12	242	0	57	12	"
57	Pingree	Early		290	24	224	24	66	0	"
58	General Gordon	"	Good	290	24	215	36	74	48	Pink.
59	Delaware	Medium	"	277	12	242	0	35	12	White.
60	Prolific Rose	"		272	48	211	12	61	36	Pink.
61	Dublin Prize			268	24	180	24	88	0	Yellowish.
62	Carman No. 3	Late	Good	264	0	215	36	48	24	White.
63	Early White Prize	Early	"	250	48	176	0	74	48	"
64	Country Gentleman	"		246	24	189	12	57	12	Pink and white.
65	Early Envoy	"		246	24	189	12	57	12	"
66	Irish Cobbler	"	Good	246	24	189	12	57	12	White.
67	Snowball	E. early		246	24	167	12	79	12	"
68	Maule's Thoroughbred	Early		233	12	189	12	44	0	Pink.
69	Seedling No. 7	Late		215	36	193	36	22	0	Bright pink.
70	Early St. George	Early	Good	215	36	140	48	74	48	Pink and white.
71	Cambridge Russet	Medium	"	206	48	162	48	44	0	White.
72	James Nugget			206	48	88	0	118	48	"
73	Bovee	E. early	Good	180	24	105	36	74	48	Pink and white.
74	Bliss Triumph	"	"	127	36	70	24	57	12	Red.
75	Early Andes	"	"	123	12	92	24	30	48	Pink.

ADDITIONAL VARIETIES OF POTATOES TESTED IN 1904.

The following varieties, some of which were sent for test, and including among their number some of the newer English sorts, were grown in smaller plots this year :—

Name of Variety.	Number of Sets Planted.	Total Yield Per Acre.		Yield Per Acre of Marketable.		Yield Per Acre of Unmarketable.		Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Ashleaf Kidney Heber Rawlings, Forest, Ont.	33	545	36	448	48	96	48	White.
Dalmeny Beauty	33	519	12	440	..	79	12	"
White Albino	33	501	36	378	27	123	12	"
Pat's Choice	33	404	48	334	24	70	24	Bright pink, red eye.
Early Johnston	33	404	48	308	..	96	48	Pale pink.
Kaiser	33	352	..	264	..	88	..	White.
Woltman	33	352	..	255	12	96	48	Red.
Charles Fidler	33	343	12	290	24	52	48	White.
Early Sunlight	33	343	12	264	..	79	12	"
Daybreak	33	343	12	228	48	114	24	Pink.
Empress Queen	33	334	24	220	..	114	24	White.
Hibernia	33	334	24	184	48	149	36	Deep pink.
Northern Star	16	334	..	211	12	123	12	White.
Evergood	33	308	..	132	..	176	..	"

Spraying Potatoes for the Prevention of Blight and Rot.

Although it has been known for about seventeen years that spraying with Bordeaux mixture will prevent the blight and rot of the potato, only a small proportion of Canadian farmers spray even yet, although the loss is very great nearly every year. This year a comparative test was made between plots sprayed with Bordeaux mixture and Bug Death applied together; Bordeaux mixture and Paris green; Bordeaux mixture made with washing soda instead of lime, and Paris green; Bug Death; and Paris green. Sixteen varieties were used in this test, each occupying one row 33 feet long, the 16 varieties covering just 1-33 of an acre being the area devoted to each test. Only fifteen sorts are reported on, as in one plot one variety had an advantage over the others and it was not included. The soil on the whole was a uniform, rich sandy loam. The potatoes were kept thoroughly cultivated until the vines met and were sprayed five times, namely, on July 2, 13, 25, August 2, 27. The plots sprayed with the Bordeaux-Bug Death mixture received an extra spraying on June 22 with Bug Death dry alone. There were no rotten potatoes in the plot sprayed with the Bordeaux-Bug Death mixture. The potatoes were planted on May 28, and dug on October 6.

TABLE I.—Experiments in Spraying to prevent Blight and Rot of Potatoes.

Name of Varieties.	Yield per acre, marketable potatoes — Bordeaux mixture and Bug Death.		Yield per acre, marketable potatoes — Bordeaux mixture and Paris Green.		Yield per acre, marketable potatoes — Soda Bordeaux and Paris Green.		Yield per acre, marketable potatoes — Bug Death.		Yield per acre, marketable potatoes — Paris Green.		Yield per acre, rotten potatoes — Bordeaux mixture and Paris Green.		Yield per acre, rotten potatoes — Soda Bordeaux.		Yield per acre, rotten potatoes—Bug Death.		Yield per acre, rotten potatoes—Paris Green.	
Main Crop Varieties.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Sir Walter Raleigh......	576	24	488	24	391	36	277	12	281	36	..	..	..	..	..	..	..	..
Rural Blush	611	36	580	48	413	36	400	24	334	24	..	..	..	..	35	12	..	..
Late Puritan............	484	..	352	..	356	24	422	24	308	..	..	..	..	..	..	..	..	..
Dreer's Standard........	308	..	215	36	268	24	167	12	206	48	..	..	..	..	70	24	..	..
Enormous..	382	48	440	..	387	12	92	24	360	48	..	..	..	..	136	24	44	..
Cambridge Russet	325	36	347	36	290	24	330	..	237	36	..	..	..	..	..	..	..	..
I. X. L	563	12	444	24	299	12	404	48	360	48	..	..	..	..	48	24	4	24
Burnaby Mammoth	475	12	365	12	378	24	440	..	396	..	..	..	..	..	13	12	..	..
Swiss Snowflake	426	48	431	12	426	48	360	48	400	24	..	..	..	..	..	..	..	..
Average	461	31	407	15	356	53	321	41	320	43	..	..	..	..	33	44	5	23
Early Varieties.																		
Rochester Rose..........	426	48	422	24	431	12	347	36	360	48	..	..	..	..	83	36	..	..
Early Rose	303	36	382	48	404	48	457	36	426	48	..	..	4	24	..	..	..	..
Lee's Favourite	233	12	250	48	264	..	246	24	176	..	..	..	..	..	35	12	..	..
Early Ohio........	343	12	255	12	343	12	189	12	233	13	..	..	..	..	48	24	..	..
Irish Cobbler............	299	12	290	24	250	48	356	24	299	12	..	..	..	..	..	..	..	..
Flemish Beauty.........	413	36	387	12	290	24	167	12	259	36	..	..	..	..	79	12	8	48
Average..........	336	36	331	28	330	44	294	4	292	36	..	..		—44	41	4	1	28
Average of all varieties, 1904................	399	3	369	21	343	48	307	52	306	39	..	..		—22	37	24	3	25
Average of all varieties, 1902...	..	..	310	12	..	..	251	6	189	54	15	18	..	..	32	24	34	28
Average of all varieties, 1901	..	..	333	43	..	..	..	..	233	11	..	..	..	..	..	..	28	44
Average for 3 years..	..	..	337	45	..	..	..	..	243	15	..	..	..	..	..	..	..	..

In the above table the fifteen varieties were divided and the results from spraying the main crop varieties averaged and kept separately from the early ones. This was to show which were influenced most by spraying. It will be seen that the main crop varieties were much more influenced this year than the early, the average greatest increase of the main crop varieties being at the rate of 140 bushels 48 pounds per acre, and of early varieties only 44 bushels per acre, or an average of both of 92 bushels 24 pounds per acre. This great difference was probably due to the fact that this year the blight did not appear until well on in August, when the crop of the early varieties was well advanced. Taking the average of the years 1901, 1902 and 1904, the increase in crop from the use of Bordeaux mixture has been 94 bushels 30 pounds per acre.

In 1902 there was an average increase from the use of Bug Death over Paris Green of 61 bushels per acre, but in 1904 there was practically no increase. There was more rot in the plots treated with Bug Death in 1904 than in those where Paris Green was used, which is difficult to account for as the soil was of a uniform character. In 1902 the amount of rot was about the same in both plots.

TABLE II.

Mixtures used, 1904.	Cost of Materials and Application per acre.	Yield per acre Marketable Potatoes, average of 15 varieties.		Increase in Crop per acre over Potatoes Sprayed with Paris Green only.		Increase in value of Crop per acre at 40 cents per bushel.	Net Loss or Gain per acre after deducting cost of materials and application.
		Bush.	Lbs.	Bush.	Lbs.	$ cts.	$ cts.
Plot 1.—Bordeaux Mixture and Bug Death— Formula—6 lbs. bluestone, 4 lbs. lime, 40 galls. water, 12 oz. Bug Death Sprayed July 13, 25, Aug. 2, 27 $22\frac{11}{16}$ lbs. per acre dry, June 22 33 lbs. per acre dry, July 2	99 lbs. bluestone at 6 cts. . . . $ 5 94 $1\frac{1}{3}$ bush. lime at 22 cts. . . . 0 29 $154\frac{11}{16}$ lbs. Bug Death at 7 cts. . . . 10 83 Total cost . . . . $ 17 06	399	3	92	24	36 96	21 86 gain.
Plot 2.—Bordeaux Mixture and Paris Green— Formula—6 lbs. bluestone, 4 lbs. lime, 8 oz. Paris Green, 40 galls. water Sprayed July 2, 13, 25, Aug. 2, 27	$118\frac{4}{5}$ lbs. bluestone at 6 cts. . . . $ 7 13 $9\frac{9}{10}$ lbs. Paris green at 19 cts. . . . 1 88 $1\frac{3}{8}$ bush. lime at 22 cts. . . . 0 35 Total cost . . . . $ 9 36	369	21	62	42	25 08	17 68 gain
Plot 3.—Soda Bordeaux and Paris Green— Formula—6 lbs. bluestone, $7\frac{1}{2}$ lbs. washing soda, 8 oz. Paris green, 40 galls. water	$118\frac{4}{5}$ lbs. bluestone at 6 cts . . . . $ 7 13 $148\frac{1}{2}$ lbs. washing soda at 2 cts . . . . 2 97 $9\frac{9}{10}$ lbs. Paris green at 19 cts. . . . 1 88 Total cost . . . . $ 11 98	343	48	37	9	14 86	4 44 gain.
Plot 4.—Bug Death— Formula—$22\frac{11}{16}$ lbs. per acre, June 22 33 lbs. per acre, July 2 $24\frac{3}{4}$ lbs. per acre, July 13, 22, Aug. 2, 27.	$80\frac{7}{16}$ lbs. Bug Death at 7 cts. . . . $ 5 63	307	52	1	13	0 49	3 18 loss.
Plot 5.—Paris Green— Formula—8 oz. Paris green to 40 galls. water	$10\frac{5}{16}$ lbs. Paris green at 19 cts. . . . $ 1 96	306	39	. . . .		. . . .	. . . .

The foregoing table shows that the Bordeaux-Bug Death mixture used in the manner described gave a net increase of $21.86 per acre in the value of the potato crop, a difference in favour of this combination over ordinary Bordeaux mixture and Paris green of $4.18. The cost of applying the different mixtures in this test is not given in the table, as the expense of spraying small plots is larger proportionately than it would be by the acre. The cost of applying the Bordeaux-Bug Death mixture was greater than the Bordeaux mixture and Paris green on account of the extra spraying on June 22, hence the difference in favour of the Bordeaux-mixture and Bug Death is really less than the table indicates, the estimated cost per acre of applying the Bug Death dry on June 22, being $1.10. The probable reason of the greater increase of yield from the Bordeaux-Bug Death mixture is that the Bug Death adheres well to the foliage and when applied with Bordeaux mixture would cause it to adhere better also.

TOMATOES—TEST OF VARIETIES.

The season of 1904 was a very unfavourable one for tomatoes, owing to so much cool, cloudy weather, and there was only about one-third of the usual crop. There were 62 varieties tested. The seed was sown in the hot-beds on March 31, and the plants pricked out into strawberry boxes on May 2, and kept in a cold frame until June 6, when they were planted in the opn air. They were planted four feet apart each way, and five plants of each variety were used . The soil was a light sandy loam which had been manured the previous season. The soil was kept cultivated until the plants covered the ground. The Sparks' Earliana which has been among the best early ripening kinds for the past four years, did not do quite so well this year, although it is still considered the best early tomato tested, being smoother than other kinds. If the Nolte's Earliest were a little smoother it would compare very favourably with Sparks' Earliana, and this year has yielded much better.

TOMATOES—TWELVE BEST YIELDING VARIETIES, 1904.

Name of Variety.	Date of First Ripe Fruit.		Yield of Ripe Fruit to Aug. 13, 1904.		Total Yield of Ripe Fruit, all pickings—5 Plants.		Total Yield of Ripe Fruit per Plant.		Remarks.
			Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	
Early Bird	Aug.	4	1	..	69	12	13	15	Below medium size, smooth, purplish pink.
Nolte's Earliest	July	22	4	2	58	2	11	10	Medium size, wrinkled, scarlet.
Democrat	Aug.	1	..	8	50	..	10	..	Medium size, wrinkled, purplish pink.
Turner's Hybrid	"	4	1	8	45	12	9	2	Large, smooth to slightly wrinkled, purplish pink.
Extra Early Red	July	26	1	12	44	8	8	14	Below medium size, smooth, scarlet.
Acme	Aug.	3	1	..	37	8	7	8	Medium size, smooth, purplish pink.
Canada Victor	July	26	..	12	36	..	7	3	Medium size, wrinkled, scarlet.
Rosedale	"	26	2	15	35	3	7	1	Medium size, scarlet.
Thorburn's Long Keeper	Aug.	4	1	..	34	4	6	14	Below medium size, regular, smooth, purplish pink.
Sparks' Earliana	July	29	1	8	33	..	6	10	Medium size, half wrinkled to smooth, scarlet.
Bond's Early Minnesota	"	29	1	12	32	8	6	8	Below medium size, smooth, purplish pink.
Thorburn's Earliest	Aug.	1	1	8	32	8	6	8	Medium size, wrinkled, scarlet.

TOMATOES—SIX EARLIEST VARIETIES, 1904.

Maule's Earliest	July	27	5	5	26	9	5	5	Medium size, wrinkled, scarlet.
Nolte's Earliest	"	22	4	2	58	2	11	10	" " "
Early Leader	"	26	3	15½	29	15½	6	..	Below medium size, half wrinkled, scarlet.
Chalk's Early Jewel	"	24	3	8	19	2	3	13	Medium size, smooth, scarlet.
New Extra Early	"	27	3	4	25	4	5	1	
Conqueror	"	27	2	14	19	6	3	14	Medium size, wrinkled to smooth, scarlet.

The varieties of tomatoes which have averaged best for a number of years and which are recommended for general planting are:—*Early*, Sparks' Earliana. *Main Crop*, Brinton's Best, Trophy, Matchless (scarlet), and Burpee's Climax, and Autocrat (purplish pink).

An experiment with a certain method of pruning tomatoes was tried this year with gratifying results. When the plants in the hot-beds had six strong leaves developed, which was on May 23, the tops were nipped off and the plants given more room, being placed 5½ inches apart. The object of pinching off the top of the plant was to cause new shoots to develop at the axils of the leaves in order to have six branches bearing early tomatoes instead of the one cluster usually found on the top of the plant. These were planted out on June 6, alongside other plants unpruned. On June 22, half of the pruned plants were again pruned, all laterals being taken out and the six main branches only being left, the other plants were left to grow at will, and it was found that they produced the most ripe fruit, though not the largest early crop. This system of pruning is very promising. The further advanced the axillary shoots are when the plants are set out the larger the early crop is likely to be. In the experiment this year the plants were not started nearly early enough to get the best results. The experiment was suggested by Mr. J. S. Littooy, Everett, Washington Territory, who has been pruning tomatoes in this way for some time in Washington, with gratifying results, where they have difficulty in ripening tomatoes.

TOMATOES—EXPERIMENT IN PRUNING.

Name of Variety.	Date of First Ripe Fruit.	Ripe Fruit First Three Pickings.	Total Yield of Ripe Fruit.	
		Lbs.	Lbs.	Oz.
Spark's Earliana—				
Unpruned	July 29	9	84	
Pruned once	Aug. 13	6	137	10
Pruned twice	" 12	18	132	13
Matchless—				
Unpruned	Aug. 4		29	
Pruned once	" 29		73	8
Pruned twice	" 29		62	

TOBACCO—TEST OF VARIETIES.

Tobacco is tested every year at the Central Experimental Farm on account of the importance of the crop. This year fifty-one varieties were grown, or at least tobacco under fifty-one different names, as it is probable that a number of them were synonyms. Twenty plants of each variety were tested, but seven kinds were grown on larger areas. The season was favourable to the tobacco crop, as although it was cool the plants grew well, and by September 9, when they were cut, the plants were nearly as mature on the whole as they usually get here. The seed was sown in hot-beds on April 4, and the plants pricked out into a cold frame on May 21, and planted in the field on June 6, in rows 3 x 3½ feet apart.

Name of Variety.	Condition when cut.	Yield of dry leaves from 20 plants.		Yield of dry leaves per acre.	
		Lbs.	Oz.	Lbs.	Oz.
Connecticut Seed Leaf	Nearly mature	13	12	2,852	2
Pennsylvania Seed Leaf	"	8	9	1,776	2
Cuban Seed Leaf	"	7	12	1,607	9
Havana Seed Leaf	"	7	9	1,568	11
Lancaster Co. Broad Leaf	"	7	7	1,542	12
Bonanza	"	7	4	1,503	14
Lack's	"	7	1	1,465	0
Gold Leaf	"	6	13	1,413	0
Honduras	"	6	5	1,309	6
Flannagan	"	6	3	1,283	7
White Burley	"	6	0	1,244	9
Warne	"	5	14¾	1,228	6
Maryland	Mature	5	13	1,205	11
Kentucky Burley	Nearly mature	5	12	1,192	11
Big Havana	"	5	10	1,166	12
Oronoka White Stem	"	5	10	1,166	12
Sumatra	"	5	9	1,153	13
Sterling	Mature	5	8	1,140	14
Comstock Spanish	Nearly mature	5	8	1,140	14
Bradley's Broad Leaf	"	5	8	1,140	14
Zimmer's Spanish	"	5	7	1,127	14
N. C. Bright Yellow	"	5	7	1,127	14
Conqueror	"	5	3	1,076	0
Hester	"	5	1	1,050	2
Persian Muscatelle	Mature	5	1	1,050	2
Small Red Canadian	"	5	1	1,050	2
Gold Finder	Nearly mature	5	0	1,037	2
Virginia One Sucker	Mature	4	15½	1,030	11
Virginia Oak Hill	Nearly mature	4	15	1,024	3
Safrano	Mature	4	13½	1,004	12
Yellow Pryor	Nearly mature	4	13	998	4
Large Havana	"	4	12	985	5
Little Oronoka	"	4	6	907	8
Yellow Mammoth	"	4	5	894	9
Oronoka Yellow	"	4	3	868	10
Hyco	"	4	1	842	11
Long Leaf Gooch	Mature	4	0	829	12
Sweet Oronoka	"	3	9	738	15
Granville Co. Yellow	Nearly mature	3	9	738	15
Primus	"	3	8½	732	7
Eastern Pride	"	3	8	726	0
Improved White Burley	"	3	7	713	0
Choice Havana	"	3	4	674	2
Turkish	Mature	3	3	661	3
Havana	"	3	2	648	3
Evans	"	3	0	622	5
Climax	Nearly mature	2	15½	615	13
Persian Rose	Mature	2	11	557	7
Small Havana	"	2	9	531	8
Cannelle	"	2	5	479	11
Vuelta de Abajo	"	2	5	479	11
Porto Rico	"	2	4	466	11
Cannelle Good Canadian	"	2	3	453	12

FOREST BELTS.

The forest belts at the Central Experimental Farm extend along its northern and western boundaries, the belt on the western boundary being 165 feet wide, and that on the northern boundary 65 feet wide. Their total length is nearly 1¾ miles. The number of trees growing in these belts, including those in a separate plantation of evergreens, is about 23,100.

One of the principal objects for which the forest belts were planted was to obtain information relating to the growth of the best timber trees, when grown on different soils at different distances apart, in blocks of single species, and in mixed plantations.

The distances chosen at first were 5 by 5 ft., 5 by 10 ft., and 10 by 10 ft. apart. In addition to obtaining information on the growth of the trees, another object of planting the belts was to find what influence they would have on the crops in the adjoining fields, both favourable and unfavourable. It was expected also that these belts would add much to the appearance of the landscape. It was hoped that other useful information regarding timber trees would also be obtained.

The first planting was done in the autumn of 1887, just seventeen years ago, and the rapid growth which most of the trees have made should be some inducement to farmers and others to plant trees.

Although the soil was not in all cases suitable for the trees which were planted in it, being very poor in some places and badly drained, at first in others, these various conditions have enabled us to note the kinds of soils which certain species will thrive in or those in which they will not do well.

It has been found that the trees which were planted 5 by 5 feet apart, the closest distance, used at first, are making the best trees from a forestry standpoint, as the side branches are killed much sooner. The trees planted 5 by 5 feet apart are more protected from storms than those further apart, and hence the tops are less injured. They are also a little taller in most cases, but are not so great in diameter as those 10 by 10 feet apart. During the first years of growth there is a great advantage in having the trees close, as in order to get thrifty growth the soil should not become hard, nor should the trees be almost smothered with weeds or grass, and to get these good conditions it is necessary to cultivate at first, and the further the trees are apart the longer one will have to cultivate, thus making the expense greater.

Until the last three years the trees in the mixed plantation were making the most satisfactory growth, and are yet making better growth than some of the clumps composed of single species, but the rapid growing kinds are developing so fast in the mixed belt that they are overshadowing some of the more valuable trees, and those which cannot endure much shade are being killed. To some extent this overshadowing is prevented by shearing the side branches and letting in more light. In nature, the proper proportion of fast and slow growing, shade-enduring and light-needing trees is gradually adjusted as the trees develop, but in artificial planting, it is very difficult to arrange them in proper proportion where a number of species are used. The fewer kinds that are employed the easier it becomes.

In some of the clumps of single species the disadvantage of not having two or more kinds mixed is quite as apparent as the disadvantage of having so many kinds mixed in the mixed belt. Ash, Butternut, Black Walnut, and Elm, which have thin foliage, do not kill the sod, and the growth on this account is checked. If other heavy foliaged kinds, such as Larch, Spruce, Pine, or Box Elder had been mixed with these the results would have been, almost certainly, much better.

Beginning in 1899 and continuing at intervals since, some plantations have been made with trees and shrubs at much closer distances apart, the largest proportion being shrubs which are used for under-growth and which grow rapidly at first, but do not reach a great height. In these plantings the trees and shrubs are but 2½ feet apart. It is too soon yet to report fully on this experiment, but the results already obtained go to show that this method, if properly carried out, has some important advantages over wider planting, one of the principal being the saving of cultivation. It is possible that 3 feet apart would be as satisfactory or more satisfactory a distance than 2½ feet. The chief shrubs used as undergrowth were Rosemary Willow (*Salix rosmarinifolia*), Alder Buckthorn (*Rhamnus Frangula*), Sand Cherry (*Prunus pumila*), and Nine-bark (*Neillia opulifolia*). The last has been found the most satisfactory, as it grows rapidly even in sod and has dense foliage.

Every year measurements are taken in the forest belts at the Central Experimental Farm, both of the annual growth in height and in diameter, and tables are published from time to time in this report, the last one appearing in 1901. In the following table will be found the measurements of the principal species of trees in the belts up to this autumn. In most cases the published figures are the averages of three average trees, but in a few instances six trees are averaged.

GROWTH of Trees in the Forest Belts at the Central Experimental Farm.

Name of Species.	Character of Soil.	When Planted.	Distance Apart.	Age or Height when Planted.	Average Height, 1900.		Average Height, 1901.		Average Height, 1902.		Average Height, 1903.		Average Height, 1904.		Average Diameter 4' 6" from ground, 1904.
			Feet.	Years.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	in.
Black Walnut—Juglans nigra	Low sandy loam	1888	5× 5	1	11	6	12	..	12	9	13	..	13	6	2¼
" "	"	1888	10×10	1	7	..	7	11	8	5	8	11	9	3	1⅔
" "	Sandy loam with small stones	1889	5× 5	2	16	4	17	7	18	8	19	6	20	1	3¼
" "	" "	1889	10×10	2	12	3	13	4	14	2	14	7	15	2	3⅛
" "	Clay loam	1888	10× 5	1	14	1	15	4	16	2	16	10	17	8	3¼
Butternut—Juglans cinerea	Low sandy loam	1889	5× 5	1	11	7	11	11	12	..	12	..	12	2	2⅙
" "	"	1888	10×10	1	10	1	10	6	10	6	10	8	10	10	1⅛
Silver-leaved Maple—Acer dasycarpum	Light sandy loam	1889	5× 5	3	27	3	28	..	28	5	28	7	28	10	2¾
" "	"	1889	10×10	3	24	8	25	1	25	8	25	5	25	8	4⅓
European White Birch—Betula alba	"	1889	5× 5	3	34	8	35	9	Dead.		..	..	..	..	..
" "	"	1889	10×10	3	37	3	38	7	39	5	Dead.		..	..	..
Canoe Birch—Betula papyrifera	"	1889	5× 5	3	31	..	32	7	33	1	33	5	34	3	4
" "	"	1889	10×10	3	31	1	32	8	34	1	34	9	35	1	5½
Yellow Birch—Betula lutea	"	1889	5× 5	3	21	10	23	..	23	9	24	1	24	2	3
" "	"	1889	10×10	3	21	8	23	6	24	3	24	9	25	6	4⅓
White Elm—Ulmus americana	Sandy loam	1889	5× 5	3	17	3	18	1	18	11	19	9	20	2	2½
" "	"	1889	10×10	3	18	9	19	8	20	9	21	4	22	4	4⅓
Black Ash—Fraxinus sambucifolia	Black muck	1889	5× 5	2	18	2	18	10	19	4	19	9	20	5	2½
" "	Low sandy loam	1889	10×10	2	11	11	12	5	N'rly dead		..	..	..	..	..
Green Ash—Fraxinus viridis	Black muck	1889	5× 5	3	20	10	22	8	24	..	25	1	26	10	3¼
" "	Low sandy loam	1889	10×10	3	17	2	18	5	19	8	21	..	21	6	3¾
Red Ash—Fraxinus pubescens	Black muck	1889	5× 5	2	22	8	24	4	26	..	26	11	28	8	3⅓
" "	Light sandy loam	1889	10×10	2	17	2	18	10	20	3	21	4	22	11	3⅜
White Ash—Fraxinus americana	Black muck	1889	5× 5	3	24	1	24	8	25	7	26	1	26	7	2¾
" "	Light sandy loam	1889	10×10	3	23	10	25	9	26	9	27	7	28	..	3⅝
Black Cherry—Prunus serotina	Light sandy loam and gravel.	1889	5× 5	3	18	11	19	11	21	2	22	1	23	2	2⅝
" "	" "	1889	10×10	3	24	4	26	7	29	..	30	3	32	1	4⅝
Box Elder—Acer Negundo	Light sandy loam	1889	5× 5	2	25	2	25	7	25	8	26	1	26	6	3¼
				in.											
Scotch Pine—Pinus sylvestris	Sandy loam with gravel	1888	5× 5	18	23	6	24	9	26	9	28	..	28	3	4⅛
" "	" "	1888	10×10	18	21	2	22	7	22	9	24	2	24	4	5⅜
" "	Low sandy loam with gravel.	1888	5× 5	18	22	9	24	2	25	8	26	10	27	9	3⅜
" "	Low sandy loam	1888	10×10	18	21	10	23	..	24	3	25	5	26	6	5⅜
" "	Light sandy loam	1888	10× 5	18	24	5	25	9	27	2	28	7	29	4	8⅛
" "	Clay loam	1888	10× 5	18	20	9	22	2	22	10	23	7	24	8	6
" "	Light sandy loam and gravel.	1888	10× 5	18	23	5	25	2	25	7	26	11	27	9	6⅞
" "	" "	1887	3× 3	9	24	4	26	..	27	..	28	4	29	4	3⅜

GROWTH of Trees in the Forest Belts at the Central Experimental Farm—*Concluded.*

Name of Species.	Character of Soil.	When Planted.	Distance Apart.	Age or Height when Planted.	Average Height, 1900.		Average Height, 1901.		Average Height, 1902.		Average Height, 1903.		Average Height, 1904.		Average Diameter 4′ 6″ from ground, 1904.
			Feet.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	In.
Austrian Pine—Pinus austriaca	Light sandy loam	1889	5 × 5	18	17	10	19	9	21	9	23	4	24	10	4⅗
" "	"	1889	10 × 10	18	18	1	19	9	20	10	22	4	23	6	6⅓
" "	"	1888	10 × 5	15	17	5	19	7	21	1	22	2	23	3	5⅓
" "	Clay loam	1888	10 × 5	15	17	..	18	11	20	10	22	4	23	7	5½
" "	Light sandy loam and gravel	1888	10 × 5	15	19	6	21	6	23	1	24	5	25	7	6
" "	" "	1887	3 × 3	15	18	..	19	8	20	11	22	5	23	7	3⅗
White Spruce—Picea alba	Light sandy loam	1889	5 × 5	15	13	2	14	2	15	1	15	7	16	5	2½
" "	"	1889	10 × 10	15	14	..	14	10	15	6	16	6	17	8	3½
Norway Spruce—Picea excelsa	"	1889	5 × 5	18	15	11	17	2	18	7	19	1	20	1	3
" "	"	1889	10 × 10	18	20	1	22	..	23	3	24	9	25	5	4⅓
" "	"	1888	10 × 5	15	23	4	25	7	27	4	29	3	30	4	5
" "	Clay loam	1888	10 × 5	15	23	11	25	11	27	7	29	11	30	11	6
American Arbor-vitæ—Thuya occidentalis	Low sandy loam and black muck	1889	5 × 5	18	15	..	16	5	17	2	18	2	18	11	3¼
" "	Low sandy loam	1889	10 × 10	18	13	9	14	10	15	6	16	1	17	3	3⅕
				feet.											
European Larch—Larix europæa	"	1888	5 × 5	2	26	10	28	..	28	11	30	4	31	10	4
" "	"	1888	10 × 10	2	27	6	28	5	28	9	29	7	31	2	5⅜
White Pine—Pinus Strobus	Light sandy loam with gravel	1889	5 × 5	8 to 10 in.	22	9	24	6	26	1	26	10	28	11	4⅗
" "	" "	1889	10 × 10	8 to 10 in.	21	..	22	7	24	5	26	..	27	9	6⅓

NOTE:—The low sandy soil in which the Black Walnut and Butternut are growing appears quite unsuitable and the trees are almost at a standstill. The light sandy soil in which some of the White Spruce are is not very suitable nor is the sandy loam where the White Elm are growing. These trees have all made much better growth in other soils.

ARBORETUM AND BOTANIC GARDEN.

Notwithstanding the severe winter of 1903-4 there were not many more trees and shrubs winter killed than usual, owing to the deep snow which protected the roots and the lower part of the trunk, but the killing back of the trees was severer than in other years. Further additions were made to the collection of trees and shrubs and to the herbaceous perennials. Of trees and shrubs 343 specimens representing 291 species and varieties were added, making the total number of species and varieties of trees and shrubs alive 3,132 when winter set in. The addition to the collection of herbaceous perennials was not large this year, but there are over 400 species and varieties available for planting next spring. A bulletin on herbaceous perennials is being prepared.

In the following table will be found a list of the genera of trees and shrubs in the Arboretum, with the number of species and varieties of each genus alive in the autumn of 1904.

No. of species and varieties alive in Arboretum, 1904.	Name of Genus.	No. of species and varieties alive in Arboretum, 1904.	Name of Genus.
4	Acanthopanax.	50	Clematis—Virgin's Bower.
122	Acer—Maple.	4	Clethra—Sweet Pepperbush.
2	Actinidia.	1	Cocculus.
38	Æsculus—Horse Chestnut—Buckeye.	10	Colutea.
3	Akebia.	38	Cornus—Dogwood.
33	Alnus—Alder.	16	Corylus—Hazel-nut, Filbert.
8	Amelanchier—June-berry.	18	Cotoneaster.
17	Amorpha—False Indigo.	116	Crataegus—Hawthorn.
1	Andrachne.	26	Cytisus—Broom.
3	Andromeda.	4	Daphne.
1	Aphananthe.	1	Decumaria.
5	Aralia.	29	Deutzia.
1	Aralidium.	31	Diervilla—Weigela.
1	Arctostaphylos.	2	Diospyros—Persimmon.
2	Aristolochia—Birthwort.	9	Elaeagnus—Olive.
5	Artemisia—Southernwood.	1	Ephedra.
1	Asimina—North American Papaw.	5	Erica—Heath.
1	Atraphaxis.	29	Euonymus—Spindle Tree.
1	Baccharis—Groundsel-tree.	1	Exochorda.
75	Berberis—Barberry.	7	Fagus—Beech.
1	Berchemia.	1	Fatsia.
42	Betula—Birch.	1	Fendlera.
1	Broussonetia—Paper Mulberry.	6	Fontanesia.
4	Buddleia.	1	Forestiera.
1	Bupleurum.	10	Forsythia—Golden Bell.
1	Bruckenthalia.	86	Fraxinus—Ash.
1	Buxus—Box.	6	Genista—Green-weed.
1	Caesalpina.	1	Grewia.
1	Calluna—Heather.	10	Gleditschia—Honey Locust.
2	Calycanthus—Carolina Allspice.	2	Gymnocladus—Kentucky Coffee Tree.
26	Caragana—Siberian Pea Tree.	2	Halesia—Silver-bell Tree.
14	Carpinus—Hornbeam.	2	Halimodendron.
1	Cassandra.	2	Hamamelis—Witch Hazel.
3	Carya—Hickory.	1	Hedysarum.
5	Castanea—Chestnut.	2	Hippophae—Sea Buckthorn.
11	Catalpa.	8	Hydrangea.
4	Ceanothus—New Jersey Tea.	9	Hypericum—St. John's Wort.
3	Celastrus—Shrubby Bitter-Sweet.	6	Ilex—Holly.
5	Celtis—Hackberry.	1	Itea.
1	Cephalanthus—Button Bush.	1	Indigofera.
1	Cercidiphyllum—Katsura Tree.	1	Jamesia.
1	Cercis—Redbud.	19	Juglans—Walnut, Butternut.
1	Cercocarpus.	1	Kalmia—American Laurel.
1	Chionanthus—Fringe-Tree.	2	Kerria.
2	Cladrastis—Yellow-wood.	1	Kolreuteria.

No. of species and varieties alive in Arboretum, 1904.	Name of Genus.	No. of species and varieties alive in Arboretum, 1904.	Name of Genus.
1	Laburnum.	26	Robinia—Locust-tree.
1	Ledum—Labrador Tea.	82	Rosa—Rose.
3	Lespedeza.	36	Rubus—Raspberry, Blackberry, Dewberry.
2	Leucothoe.	157	Salix—Willow.
24	Ligustrum—Privet.	41	Sambucus—Elder.
1	Lindera—Wild Allspice.	1	Schizandra.
2	Liriodendron—Tulip Tree.	1	Securinega.
107	Lonicera—Honeysuckle.	6	Sophora.
9	Lycium—Matrimony Vine.	85	Spiræa—Meadow-Sweet.
1	Lyonia.	5	Staphylea—Bladder-Nut.
3	Magnolia.	2	Stephanandra.
1	Menispermum—Moonseed.	2	Styrax.
14	Morus—Mulberry.	13	Symphoricarpus—Snowberry.
5	Myrica—Bayberry.	1	Symplocos.
1	Nandina	162	Syringa—Lilac.
2	Myricaria.	8	Tamarix—Tamarisk.
7	Neillia—Ninebark.	2	Tecoma—Trumpet Flower.
1	Nemopanthus—Mountain Holly.	37	Tilia—Linden, Basswood.
1	Neviusia.	92	Ulmus—Elm.
1	Nuttallia.	2	Vaccinium—Cranberry, Blueberry, Bilberry. Huckleberry.
1	Nyssa—Pepperidge—Sour Gum.	29	Viburnum—Arrow-wood.
2	Ostrya—Hop Hornbeam—Iron-wood.	1	Vitex.
1	Ononis.	32	Vitis—Grape, Virginian Creeper, Ivy.
1	Ostryopsis.	9	Wistaria.
1	Oxydendron—Sorrel Tree—Sour Wood.	1	Xanthorrhiza—Shrub—Yellow-root.
1	Pachysandra.	1	Xanthoxylum—Prickly Ash.
2	Paeonia—Paony.	4	Yucca.
1	Paliurus—Christ Thorn.	4	Zelkowa.
1	Parrotia.		
1	Peraphyllum.		
1	Periploca.		Conifers.
3	Phellodendron.		
62	Philadelphus—Mock Orange—Syringa.		
5	Photinia.	36	Abies—Fir.
1	Pirrasma.	2	Cedrus—Cedar.
9	Platanus—Plane Tree—Buttonwood.	40	Cupressus—Cypress.
51	Populus—Poplar.	4	Ginkgo—Maiden-hair Tree.
5	Potentilla—Cinque-foil.	66	Juniperus—Juniper.
138	Prunus—Almond, Peach, Apricot Plum, Cherry.	7	Larix—Larch—Tamarack.
		75	Picea—Spruce.
8	Ptelea—Wafer Ash.	45	Pinus—Pine.
3	Pterocarya.	1	Pseudolarix.
1	Pterostyrax.	3	Pseudotsuga.
217	Pyrus—Pear, Apple, Mountain Ash, Quince, Medlar.	2	Taxodium—Bald Cypress.
		12	Taxus—Yew.
98	Quercus—Oak.	67	Thuya—Arbor Vitae.
27	Rhamnus—Buckthorn.	5	Tsuga—Hemlock.
6	Rhododendron.		
1	Rhodotypos.	3,132	Total number of species and varieties alive autumn of 1904.
14	Rhus—Sumach.		
57	Ribes—Currant, Gooseberry.	180	Genera.

REPORT OF THE CHEMIST.

(FRANK T. SHUTT, M.A., F.I.C., F.S.C., F.R.S.C.)

OTTAWA, December 1, 1904.

DR. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the eighteenth annual report of the Chemical Division of the Experimental Farms.

Though much of a new and interesting character will be found in the results here presented, the investigations undertaken during the past season have for the most part been similar in nature to those of former years. More or less assistance has been rendered in all the branches of agriculture and, as far as possible, the more important problems affecting the farming interests of the various provinces of the Dominion have received attention and study.

In addition to the work here recorded, we have examind a large number of samples of an agricultural nature received from farmers.

Help also of a direct character has been given the individual through correspondence—an important branch of the work of the division.

Addresses have been delivered at several of the larger agricultural conventions in Ontario and Quebec, the following titles indicating the character of the matters discussed:—

'The Economic Maintenance of Soil Fertility.'
'The Importance of Clover as a Source of Humus and Nitrogen.'
'The Control of Soil Moisture in Orchards.'
'The "Cover" Crop and Cultivation; their Relative Importance in the Management of Orchard Soils.'
'The composition of Concentrated Feed Stuffs as sold in Canada.'
'The Factors which Control the Moisture Content of Butter.'
'The Changes in Honey on Storage in a Damp Atmosphere.'

Tour in British Columbia.—At the special request of the Provincial Government, two months were spent in visiting the more important agricultural areas of British Columbia. An account of this interesting and instructive tour will be found at the conclusion of the accompanying report.

Soils.—A number of virgin soils from British Columbia have been submitted to careful analysis. These include representative samples from Kingcome Inlet, Cape Scott, Balfour and Kualt. A soil from New Liskeard (New Ontario) and one from the Peace River district have also been examined and are now reported upon.

In addition to these, we have received a large number of soils from farmers all over the Dominion. These have not received complete analysis—and consequently do not find a place in this report. From a preliminary examination and the determination of certain elements of fertility we have endeavoured to draw conclusions regarding the rational treatment of these soils, and these particulars we trust have proved of value to those sending the soils.

Control of Soil Moisture.—Further experiments have been conducted, in the orchards of the experimental farms at Ottawa and Nappan. The results are well in accord with those of our former researches and at the same time serve to emphasize certain important features in soil management which had not hitherto been investigated.

Fodders and Feeding Stuffs.—During the past three seasons an investigation has been carried on with the object of determining the amount of dry matter, protein, &c., as produced per acre by Indian corn sown in hills and drills, respectively. This work is now reported upon.

Analysis of Rape ensilage and ensilage of mixed Rape and Corn are given and the values of these new succulent fodders discussed.

A considerable number of milling products, meat meals, and stock foods have been examined during the past year. These analyses now constitute an important branch of our work, owing to the many new products and condimental foods being constantly put upon the market.

Materials of Fertilizing Value.—These include samples of wood-ashes, ashes from muck, &c., &c., received from farmers in various parts of Canada. The results obtained on the more important of these are here given and briefly discussed.

Sugar Beets.—We have determined the amounts of plant food withdrawn from the soil by this crop as grown for factory purposes. The results show the nitrogen, phosphoric acid, potash, and lime contained in the roots, crowns and leaves, respectively, in the beet at three stages of growth, and may serve as a guide in the rational manuring of this crop.

The richness and purity of the varieties, Vilmorins' Improved, Klein Wanzleben and Très Riche—probably the three best for factory purposes—as grown on the several Experimental Farms of the Dominion, have been ascertained and tabulated.

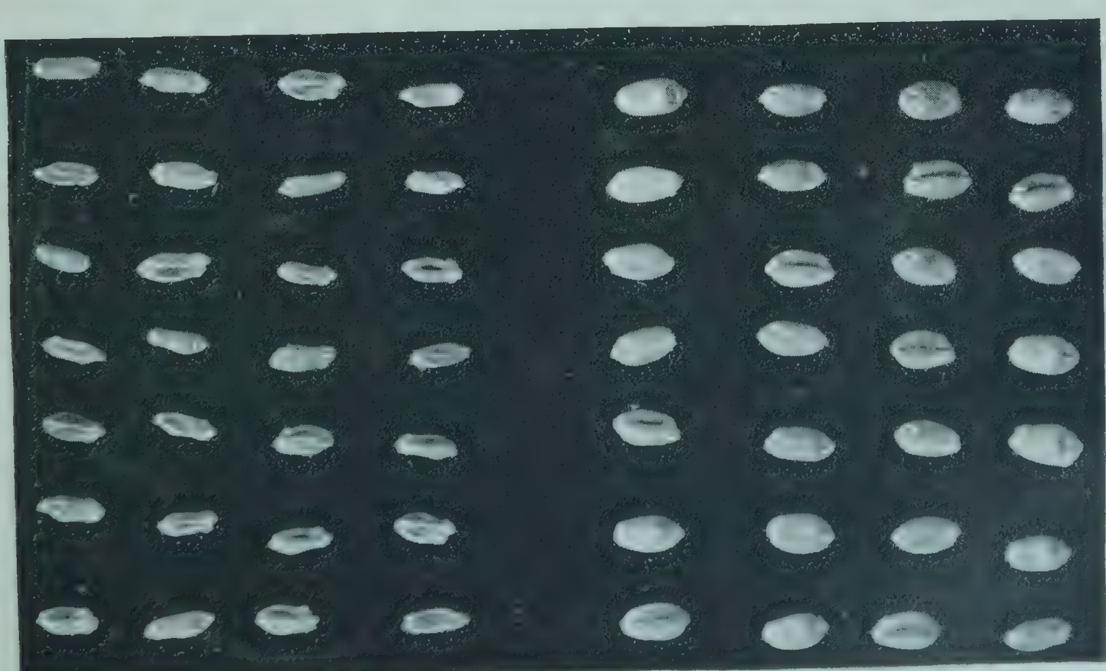
Roots.—A continuance into the inquiry respecting the amounts of dry matter and sugar furnished by the different classes of farm roots has been made. The data will be found of interest and value to all farmers growing roots for feeding purposes.

The Effect of Rust on the Straw and Grain of Wheat.—This research was undertaken by reason of the prevalence of rust in the wheat fields of certain districts in Manitoba. It has shown clearly that the rust arrests development of the wheat plant resulting more particularly in a straw of greater feeding value than that of the normally mature wheat, and in a very much shrivelled kernel, slightly richer in albuminoids than in the plump grain from rust-free wheat.

Well Waters from Farm Homesteads.—Analyses have been made, from the hygienic standpoint, of about 100 samples of well waters from farms, creameries and cheese factories, and reports in detail sent to those forwarding the waters. The tabulated results here given are accompanied by a very brief conclusion as to the quality of the supply. Those desiring to avail themselves of the privilege extended by the experimental farms in this matter should write for a copy of the instructions which it is necessary to closely follow in the collection and shipment of water for analysis.

Intimately connected with the matter of a good water supply is that of an effective drainage system. We have accordingly given an account of the Septic Tank, which, we consider, practically solves the problem of the safe disposal of the sewage of the rural home.

Correspondence.—The letters directed to this division from November 30, 1903, to December 1, 1904, in addition to those referred to us by the other departments of the farm, numbered 1,284; those sent out, 1,251.



(By Frank T. Shutt.)

KERNELS OF RUSTED WHEAT. KERNELS OF RUST-FREE WHEAT.

Samples Received for Analysis.—Subjoined will be found, in classified form, an enumeration of the samples received from farmers for analysis.

SAMPLES received for Examination and Report.

November 30, 1903, to December 1, 1904:

Samples.	British Columbia.	North-west Territories.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.	Number still awaiting examination.
Soils	16	23	.....	139	5	1	68	1	253	38
Muds, mucks and marls	2	......	....	2	3	1	6	2	16	11
Manure and fertilizers	2	......	......	7	5	1	5	1	21	5
Forage plants and fodders	2	8	8	65	8	4	10	3	108	2
Well waters	7	20	3	31	15	15	7	2	100	.....
Miscellaneous, including dairy products, fungicides and insecticides	12	1	2	69	10	2	5	2	103	26
	41	52	13	313	46	24	101	11	601	82

Acknowledgments.—It is again my pleasure to publicly record my sincere thanks to Mr. A. T. Charron, M.A., Assistant Chemist, and Mr. H. W. Charlton, B.A.Sc., Second Assistant Chemist, who have so well and faithfully performed the tasks allotted to them during the past year. The work of the Chemical Division has very materially increased in all its branches, and necessarily a very large portion of it falls upon these gentlemen. In this work they have manifested an enthusiastic interest, performing their duties with skill and industry. It is for this hearty co-operation that my thanks are particularly due.

I also desire to tender my thanks to Mr. J. F. Watson, who has again performed to my perfect satisfaction the large amount of clerical work in connection with the division.

I have the honour to be, sir,

Your obedient servant,

FRANK T. SHUTT,

Chemist, Dominion Experimental Farms.

SOIL INVESTIGATIONS.

BRITISH COLUMBIA.

Cape Scott, Vancouver Island.—This sample was forwarded by Mr. J. R. Anderson, Deputy Minister of Agriculture, Victoria, B.C., who furnished the following information: 'A virgin soil with a depth of 2 to 4 feet, underlaid by a hardpan. This soil is representative of nearly all the soil on the north-east end of Vancouver Island, except on some small river bottoms. It is lightly timbered with hemlock, cedar, pine, and the soil is covered with moss.'

Surface Soil.—Judging from its appearance, this is very largely vegetable matter and might be rightly classed as peat, or more properly speaking, swamp muck. Though

rich in nitrogen, such soils do not contain this element in a readily assimilable form. The chief disadvantages of soils of this character for farm crops, however, generally lie in the very small proportions of sand and clay they contain and their deficiency in the mineral constituents of plant food—lime, phosphoric acid and potash and, further, their acid or sour character also renders them unfavourable for many crops.

Analysis of (air-dried) Soil.

Moisture	5·26
Organic and volatile matter	81·55
Insoluble residue (clay and sand)	10·65
Oxide of iron and alumina	2·38
Lime	·48
Magnesia	·16
Potash	·06
Phosphoric acid	·09
	100·63
Nitrogen, in organic matter	1·65

The soil as received was strongly acid, and on drying by exposure became extremely hard and refractory.

The above data are in close accord with those we have obtained from swamp or black mucks collected in various parts of the Dominion, and clearly indicate that the remarks already made regarding their characteristics and faults are strictly applicable to the soil under consideration.

The general treatment for their reclamation and improvement may be outlined as follows:—

Drainage.—This should be as thorough as possible. The removal of all free or stagnant water results in the aeration of the soil, the correction of its sourness and the improvement of its mechanical condition by causing it to become more firm or compact.

Admixture with Subsoil.—Whenever the depth of the surface soil will allow the plough to reach the subsoil, there should be a certain admixture of the underlying stratum with the muck. This will serve to improve the latter, both mechanically and chemically. Where this plan is not feasible by reason of the great depth of the surface soil it would be advisable to dress heavily with sand or clay, or better, a mixture of both. Unfortunately, the expense of this latter plan prevents its general adoption.

Fertilizers.—Muck soils, as already remarked, are rich in humus and nitrogen; nevertheless, for a season or two until the soil 'sweetens' and nitrification ensues, dressings of barnyard manure will be found of value in encouraging growth by applying immediately available nitrogen.

The chief requirements of such soils are, however, the mineral constituents of plant food. If wood ashes are obtainable no better fertilizer could be recommended, as they supply lime, potash and phosphoric acid. An application of 50 to 80 bushels per acre, harrowed in, should have a marked effect upon the crop. A dressing of lime, simply, will also be of great value (say, 40 bushels per acre), though it should, if possible, be supplemented by potash and phosphoric acid in one or other of their forms. Marl, a natural deposit of carbonate of lime, frequently found in connection and underlying peat or muck, is very useful for such soils as we are considering. A heavy dressing of 'gas lime' has been found valuable for such soil. Basic (Thomas) slag will, I believe, be found very useful for such soils. It presents phosphoric acid

associated with lime in an alkaline form, and, therefore, particularly adapted for sour, peaty soils. It might be tried at the rate of 300 to 500 lbs. per acre, together with 100 to 200 lbs. of muriate of potash.

In all this work it should be the aim not to bury the fertilizer, but to keep it in the surface few inches of the soil. It will naturally and of its own accord tend to sink.

Crops.—There are few crops that will give lucrative yields on muck soils unless the latter received some treatment as already outlined. Probably Timothy succeeds best of all on the crude muck. Neither roots nor cereals can be considered as naturally adapted to such soils, but several may be grown with profit after the lacking mineral elements have been supplied. Potatoes, mangels, oats and Indian corn have all done fairly well under such improved conditions.

Subsoil.—This is of the nature of a 'hard pan,' consisting chiefly of compacted sand. It, nevertheless, contains some organic matter and nitrogen, as is shown by the following partial analysis.

Analysis of (air-dried) Subsoil.

Moisture..	2·99
Organic and volatile matter..	11·07
Sand and other rock matter..	85·04
	100·00
Nitrogen..	·123

This subsoil is not, unfortunately, rich in lime or phosphoric acid, but this should not prevent its judicious admixture with the surface soil wherever possible, for such would undoubtedly enhance the crop-producing power of the latter.

Kingcome Inlet, B.C.—A dark-gray loam of granular texture, in which the comparatively large amount of organic matter is intimately incorporated with the silt and fine sand which form the mineral basis of the soil. Laboratory trials go to show that the mechanical or physical condition of this soil is excellent and that it would be suitable for the majority of farm crops.

Our correspondent, in forwarding the soil, furnishes the following particulars: 'This is representative of the soil in this valley. The soil has been dyked and cultivated for seven years. Occassionally, perhaps once a year, the tide will overflow the dyke. It is underdrained with cedar drains and the water does not lie on the land. The climate here is decidedly wet, for the rainfall is a heavy one, but there is no record kept. Please advise me as to the best fertilizer to use.'

Analysis of (air-dried) Soil.

Moisture..	1·70
Organic and volatile matter..	10·43
Insoluble matter (sand, &c.)..	73·82
Oxide of iron and alumina..	13·15
Lime..	·25
Magnesia	?
Potash..	·64
Phosphoric acid..	·26
	100·25

Nitrogen	·369
Available potash	·0188
" phosphoric acid	·0185
" lime	·088

The foregoing results are indicative of great crop producing power The soil contains an abundance of organic matter rich in nitrogen and the mineral elements of plant food—and especially potash—are for the most part present in amounts equal to those in many of our finest and most fertile soils. It may further be stated that the percentages of potash and phosphoric acid in an 'available' condition are considerably above the average.

What perhaps might be termed a weakness of this soil is its small lime content. This fact, in conjunction with the slight, but distinct acid reaction of the soil, leads me to suggest an application of lime, wood-ashes or basic slag as most probably the treatment which above all would give increased crop yields. It is essential, however, that the drainage be made as effective as possible.

Lime might be applied at the rate of 25 to 40 bushels per acre; wood-ashes, 35 to 50 bushels, and basic slag, 300 to 500 pounds per acre. The latter fertilizer, owing to its alkalinity, would, I think, on this soil be a more suitable form in which to furnish lime and phosphoric acid than superphosphate, which is an acid form of phosphoric acid. From the standpoint of economy, it might be advisable to give lime a trial before investing in the more expensive basic slag.

Special examination was made for salt, as it was stated that the tide occasionally overflowed the land, but the amount found, 0·023 per cent, was so small that its presence could not be considered as at all injurious to crops.

Kualt, on Shuswap Lake, near Salmon Arm.—'Virgin' soil from the south side of mountain (Notch Hill) with a lake on the east side of it. It is somewhat elevated, but can be irrigated if necessary.

This is a light-grey sandy loam, and having the appearance of being deficient in humus.

Analysis of (air-dried) Soil.

Moisture	1·32
Organic and volatile matter	3·57
Insoluble residue (chiefly sand)	88·96
Oxide or iron and alumina	5·30
Lime	·27
Magnesia	·22
Potash	·15
Phosphoric acid	·82
	100·61
Nitrogen	·051
Available phosphoric acid	·268
Available potash	·011

The data makes it evident that the want here is organic matter (humus) and its concomitant nitrogen, and we have again to advise the growth and ploughing under of green crops (preferably clover or some other legume) to supplement the available supply of farm manures.

Probably the application of immediately available nitrogen (as in nitrate of soda) will be necessary to induce a vigorous growth until the soil, by the means just advocated, becomes richer in this element.

The soil appears to be remarkably rich in phosphoric acid, and analysis further shows that a considerable proportion is available for plant growth. Judging, therefore, from the present results, an application of a phosphatic fertilizer would not be profitable.

Though the available potash is not very low, the 'total' potash is considerably less than that in average productive soils. It is probable, therefore, that in time potash fertilizers would prove useful.

The lime-content is by no means large and we should, therefore, expect that applications of this element from time to time would be beneficial.

Balfour, 17 miles east of Nelson, West Kootenay, B.C.—'A bench soil, naturally drained, as yet uncropped and unmanured, from 6 to 10 inches deep and overlying a subsoil of white sand, which again rests on gravel. The sample is stated to be representative of at least 1,200 acres.'

The sample forwarded had been taken *in situ* to a depth of 14 inches. The upper 6 inches were considered as representing the surface soil and accordingly the soil to that depth was separated and prepared for analysis. Speaking generally, from an inspection, the soil would be considered as extremely light and sandy and poor in humus, especially below four inches. It had a distinctly acid reaction. The nature of the vegetation on the soil—chiefly mosses—afforded further evidence as to the need of aeration and neutralization.

In a letter to Mr. J. R. Anderson, Deputy Minister of Agriculture, Victoria, B.C., (through whom the soil was submitted) the farmer says: 'The oats and corn that I sowed last spring did not amount to anything, but I am told that all it requires is working. It is said here that the first year or two very little of anything will grow, but that afterwards—when it had become sweet—the soil will give good returns.'

Analysis of (air-dried) Soil.

	Per cent.
Moisture	1·04
Volatile and organic matter	3·15
Insoluble matter (sand, &c.)	84·27
Oxide of iron and alumina	9·94
Lime	·47
Magnesia	·39
Potash	·21
Phosphoric acid	·60
	100·07
Nitrogen	·045
Available potash	·008
Available phosphoric acid	·075
Available lime	·033

The analytical data support the deduction made from the appearance of this soil as to its poverty in organic matter and nitrogen. In both these constituents the percentages are considerably below those in soils of average productiveness, pointing to the desirability of organic manures for the improvement of the soil, both chemically and physically. Green manures, obtained preferably through the growth of one or other of the legumes, are advised in order to supplement the store of farmyard manure. Nitrogen for immediate crop use may be supplied by small and repeated dressings of nitrate of soda or sulphate of ammonia during the early part of the growing season.

Our results would go to show that it is very well supplied with phosphoric acid. Both the 'total' and 'available' are considerably above the average and we should not, therefore, expect a phosphatic fertilizer to be necessary.

The possibilities are strong that the soil will respond to applications of lime and potash. For this, no better fertilizer could be found than wood ashes. If such are not obtainable, potash may be used in the form of kainit or of muriate of potash, and lime —or some compound of lime—as marl or gas lime, as circumstances allow, employed.

PEACE RIVER DISTRICT.

This soil was collected by Mr. James M. Macoun, of the Geological Survey of Canada, during his exploration in the Peace River district in 1903. The analysis was made in order to obtain chemical evidence as to the quality of the land, the results to accompany the report of Mr. Macoun on the agricultural possibilities of that district.

The samples (soil and subsoil) were taken near Saskatoon on Serviceberry lake at the west end of the Grande prairie, Lat. 55° 15′, Long. 119° 11′.

Surface Soil.—A heavy clay loam, but containing a small percentage of fine sand. Black or very dark brownish-black, from presence of humus (vegetable matter). As received, in the air-dried condition, it was in lumps and powder, the former, while not readily friable, could not be considered refractory. It had all the appearance of a fertile loam, and one that would prove suitable for the majority of farm crops, provided it were deep enough.*

It was found to have a very slightly acid reaction. Tested for 'alkali,' only traces of common salt were found, though careful search for injurious sodium and magnesium compounds was made. A qualitative examination for lime, showed that the soil was by no means deficient in this element. A partial analysis of the air-dried sample furnished the following data:—

	Per cent.
Moisture	3·44
Organic and volatile matter	11·82
Nitrogen	·471

We have in these results ample and emphatic evidence of the richness of this soil in humus compounds and nitrogen, equalling in these respects much of the fertile prairie soil of Manitoba and the North-west Territories. Time has not allowed any determination of the potash and phosphoric acid, but judging from past experience with soils of a similar humus and nitrogen content, this soil in all probability is well suppled wth these consttuents.

Subsoil.—This, as received, was in hard, exceedingly refractory lumps, of a greyish colour. Though in appearance and texture it was of an undesirable nature for mixing with the surface soil, analysis showed it to contain notable amounts of organic matter and nitrogen. The data are as follows:—

	Per cent.
Moisture	3·42
Organic and volatile matter	8·01
Nitrogen	·174

The general deductions that I am enabled to make from this preliminary examination are that the soil is by no means wanting in the elements of fertility, the chief drawback being its reported shallowness. With good drainage, careful culture—particularly avoiding all working of the soil when wet—and favourable climatic conditions, it should prove a strong, productive soil, quite capable of yielding remunerative crops.

* Mr. Macoun states that the surface soil is but 3 or 4 inches thick, resting without any gradual transition on the heavy plastic subsoil of clay.

ONTARIO.

New Liskeard, Nipissing District.—A yellowish-red, coarse-grained, sandy loam, showing a fair amount of root fibre and underlaid by clay at a depth of from 6 inches to 2 feet. This soil, our correspondent states, has never been cropped, manured or burnt over and is covered with 'spruce, cedar, red pine, and cyprus.' 'Possibly the area covered by this soil is 20 square miles.'

From an inspection of the soil one would judge it to be deficient in humus and apt, in seasons of drought, to rapidly dry out.

Analysis of (air-dried) Soil.

	Per cent.
Moisture	1·45
Organic and volatile matter	4·57
Insoluble matter (sand, &c.)	84·97
Oxide of iron and alumina	7.74
Lime	·36
Magnesia	·55
Potash	·10
Phosphoric acid	·10
Undetermined	·16
	100·00
Nitrogen	·072

These results indicate that in all the essential elements of plant food—nitrogen, phosphoric acid, potash and lime—this soil is considerably below the average of our productive virgin soils.

Whether it will prove profitable to work such a soil as a farm is certainly doubtful, but that can only be definitely determined by actual trial. The possibilities, however, are that it would yield a larger return in timber, if carefully husbanded and managed according to the prinicipIes of forestry. Such soils as the one under consideration may, of course, be improved, and made to give fairly good yields if the requisite amount of plant food be supplied. They are responsive and under favourable climatic conditions with a sufficiency of manure are to a certain degree suitable for potatoes, hay and oats, and perhaps a few other crops. But it must be remembered that soils such as the one under consideration rapidly deteriorate when worked (owing to loss of humus) unless continually replenished with organic matter from one source or another. It seems, therefore, desirable, if employed agriculturally, to use them largely for grazing or to adopt such a rotation as will every few years give the soil a crop of clover or some other legume, and thus keep up the store of humus and nitrogen.

Shallow ploughing should be adopted for a number of years, in order to make practicable the enrichment of the upper few inches of the surface soil. The drainage is possibly good, but if not, it should be made so. The turning under of clover or pease, in addition to the application of such barnyard manure as is available cannot be too strongly recommended, and wood-ashes or a mixed fertilizer containing phosphoric acid and potash, could no doubt be used to advantage to supply the necessary mineral elements.

FERTILIZERS AND AMENDMENTS.

WOOD ASHES FROM SAW-MILLS AT PORT MOODY, B.C.

We have in a former publication (see p. 156, Report, 1901) endeavoured to correct the impression prevalent in parts of British Columbia that there is but little fertilizing

value in the ash of the soft woods—Douglas fir, cedar, &c.—grown in that province, and we have ventured the opinion from the examination of many soils, both on Vancouver Island and on the mainland, that the application of such ashes would be found to give a good return, more particularly on the sandy and peaty loams. It is of interest, therefore, to insert the following analysis of a sample of such ashes recently made in the Farm laboratory.

The correspondent forwarding the ashes says: 'The sample of ash is from the sawmill at Port Moody. There are many tons lying out in the yard and thought to be useless. We in this vicinity, as fruit-growers and gardeners, wish to know what fertilizing value it may have. It is principally the ash from slabs of fir, with some cedar taken from booms out of the salt water. You will confer a great favour on us here by your earliest reply.'

Analysis of Ashes.

Moisture	·82
Potash	1·91
Phosphoric acid	1·76
Carbonate of lime	36·55

Though not equal, as regards potash, to hard wood ashes, I should certainly consider these ashes as a valuable fertilizer, especially in conjunction with farm manures or clover turned under. In addition to the potash and phosphoric acid they contain, there is a notable amount of carbonate of lime present—and this fact alone would make the ashes valuable for the soils already referred to. The probability is, from what our correspondent says regarding the storage of these ashes, that they are partially leached and have thus lost a considerable proportion of their most important element—potash. We are inclined to think that with a little care and protection, such ashes should contain at least between 3 per cent and 4 per cent of potash. The use of wood ashes may be specially recommended for all classes of fruits, for vegetables and other leafy crops, and for the encouragement of vigorous growth in clover.

LEACHED WOOD ASHES.

Occasionally we are in receipt of inquiries regarding the value of leached wood ashes. This value, we have pointed out, will be dependant upon the extent to which leaching has occurred. In the following data we present the results obtained from a sample of such ashes, and they go to show the disastrous effect of exposure as regards the potash content.

Analysis.

Moisture	2·18
Charcoal (loss on ignition)	26·59
Mineral matter (soluble in acid)	54·92
" " (insoluble in acid)	16·31
	100·00
Potash, soluble in water	·24

It is evident that these ashes have been very thoroughly leached, and are of very little value as far as potash is concerned. There will, of course, be a certain amount of phosphoric acid present, probably between 1 per cent and 2 per cent. The greater part of the mineral matter 'soluble in acid' is lime, or, rather, carbonate of lime. For land needing lime, such ashes would be useful, and the price that the farmer or fruit grower should give for them should be estimated entirely from that point of view.

This sample was forwarded from 'an old ashery near St. Catharines, Ont., that has not been disturbed for many years.' We think this is an extreme case of leaching,

but it certainly furnishes a marked illustration of the loss that ashes may suffer through want of proper protection from rain. In former samples of leached ashes examined in the Farm laboratory, we have usually found between 2 per cent and 4 per cent potash.

ASH OF ROCK MAPLE.

A sample of ash from rock maple, forwarded by Mr. James L. Matheson, Dundas, P.E.I., furnished the following data:—

Analysis.

	Per cent.
Moisture	·24
Organic and volatile matter (chiefly charcoal)	12·68
Insoluble residue (clay and sand)	1·32
Potash	12·46
Lime	42·46
Phosphoric acid	2·95

Our correspondent, in forwarding these ashes, says:—'These were obtained from the Rock maple and are much lighter in colour than those usually seen here. We are interested to know how they compare in fertilizing value with ordinary hardwood ashes.'

Good samples of commercial wood ashes will contain, as a rule, from 5 per cent to 6 per cent potash, and from 1·5 per cent to 2 per cent phosphoric acid. It is thus seen that the sample under consideration is much superior, as regards its most valuable element, potash.

We have frequently in our publications called attention to the fertilizing value of wood ashes, especially as a source of potash. Without unnecessarily repeating what has been said as to the composition of ashes and the crops for which they are best suited, it may be advantageous to point out that while the commercial value of ashes will depend upon the potash and phosphoric acid content, the manurial value will be considerably higher. The presence of a large amount of lime, the mild alkalinity of the ash, the particular combinations in which two elements of plant food are held, are all, undoubtedly, factors that enhance the value of wood ashes as a fertilizer. In other words, the benefits derived from their use include, in addition to the supplying of mineral plant food, the correction of sourness, the conversion of injurious iron compounds into harmless forms, the encouragement of nitrification, and the general improvement of the tilth of the soil. It has frequently been noticed that soil to which ashes have been applied is much better able to resist the injurious effect of a protracted drought than adjoining land which has not been so treated.

ASHES FROM MUCK.

Two samples of ashes obtained by the burning of muck in heaps, were forwarded by Mr. James Hopgood, West Cape, P.E.I., who writes: 'These ashes were made by piling soft wood stumps and covering over with partially dried-out muck. The bulk of the ashes is like No. 1, dark-grey and heavy. There is, however, a fair proportion of No. 2, which is light in character and almost white. Do you think it is worth while to go to any expense in making these ashes?'

Analysis.

	No. 1.	No. 2.
Moisture	·77	3·02
Insoluble matter (clay, sand, &c.)	77·83	73·55
Oxide of iron and alumina	7·46	3·89
Lime	6·40	7·00
Potash	·30	·51
Phosphoric acid	·39	·57

In No. 1, there is a very large proportion of sand; in No. 2, the chief constituent is silica—also valueless as plant food.

Though undoubtedly possessing a certain fertilizing value, both these ashes are decidedly inferior to wood ashes. The potash and phosphoric acid are not present in amounts larger than those found in most fertile soils, but they are possibly in a more available condition. The lime would prove beneficial for certain soils, but we do not think the data warrant any great expense in obtaining the ashes. No. 2, is the much more valuable ash, as will be evident from the larger percentages of potash and phosphoric acid.

The most valuable fertilizing constituent of muck is nitrogen, and the next in importance is the organic matter. Both of these are lost in burning the muck, and for this reason we counsel composting by one or other of the methods outlined in our report for 1903.

ASHES FROM CARBIDE WORKS.

These so-called 'ashes' are described as 'the residue from the manufacture of the carbide' and were forwarded from the carbide factory at St. Catharines, Ont. They are not to be confused with the residue from the acetylene gas machine, (resulting from the action of water on carbide), which as we have repeatedly stated, is practically slacked lime. In the formation of carbide in the electrical furnace, the outside portion of the mixture is but imperfectly acted upon and it is this, we conclude, separated from the carbide, that constitutes these 'ashes.'

Analysis.	Per cent.
Moisture	11·51
Loss on ignition (carbon and coke)	13·88
Residue, insoluble in acid	5·86
Oxide of iron and alumina	3·50
Lime (present partly as carbonate)	46·53
Potash	·12
Phosphoric acid	slight traces.
Nitrogen	1·02

As regards the mineral constituents of plant food, it is evident that this material can have no agricultural value, save for the lime it possesses. Phosphoric acid is absent, or practically so, and the potash is present in an amount less than that found in most fertile soils. Such ashes, however, are undoubtedly of value as an amendment for soils deficient in lime or requiring lime to correct sourness or improve their tilth.

The nitrogen is 1 per cent., or 20 lbs. per ton, and the question naturally presents itself as to its availability for plant use. To obtain information regarding this matter certain experiments were made, with the following results:—

1. Ten (10) grams of ashes, to which were added 500 cc. of water, were distilled with magnesia. This resulted in obtaining ·11 per cent nitrogen. This shows that practically 10 per cent of the total nitrogen present exists in the form of ammonia salts, or in such a combination that under the conditions of the experiment ammonium compounds are formed. Distillation with water only gave ·075 per cent nitrogen.

2. Ten (10) grams of the material were digested in the cold with 200 cc. water for two hours and filtered. 100 cc. of the filtrate were distilled after being made strongly alkaline with magnesia, but no ammonia was obtained. This proves that no part of the nitrogen exists either as free ammonia or as ammonium salts.

3. Two (2) grams were extracted in the cold with dilute sulphuric acid, filtered and filtrate made alkaline and distilled. Nitrogen amounting to 0·94 per cent was obtained.

4. Hydrogen was passed over the ashes (5 grams) in a red-hot tube. The gas was conducted into diulte sulphuric acid, which was subsequently made alkaline and distilled. Nitrogen amounting to 0·72 per cent was obtained. Unfortunately the furnace at our disposal for this class of work is not very satisfactory as regards obtaining high temperatures, and it is probably owing to this fact that this experiment did not result in a larger percentage of nitrogen.

However, there seems to be no doubt that the nitrogen of the fresh material exists very largely, if not entirely, as calcium nitride. By paragraph 2, it will be seen that the absence of ammonium salts was proven.

On keeping the ashes, as in a bottle, it was found that a considerable amount of ammonia developed.

As to how soon such nitrogen might become available to plants we cannot at present say, but from the fact that ammonia is so readily formed in the presence of moisture, there seems a strong probability that this material may be found of some value as a nitrogenous fertilizer.

ASHES FROM INCINERATOR.

These are the product of the crematory or incinerator at Montreal. In forwarding them for analysis, the Hon. J. A. Ouimet writes : 'These ashes are from burnt garbage, &c. It is a matter of some importance for farmers and others in the neighbourhood to know what fertilizing value they may possess.'

As received, this sample consisted of fine ash mixed with a large proportion of cinders and clinkers, among which were observed many pieces of glass, crockery and unburnt coal. A few fragments of burnt bone were also noticed.

Analysis.	Per cent.
Moisture	·45
Insoluble mineral matter	75·83
Lime	3·80
Phosphoric acid	1·08
Potash	·44

A mechanical separation gave 66 per cent cinders, &c., and 34 per cent fine ash.

The fertilizing value of these ashes, it will be seen, is extremely small, being represented practically by the phosphoric acid, which the analysis shows to be in the neighbourhood of 1 per cent. We cannot, therefore, regard this waste product as of any importance from the manurial standpoint. It might, however, be used to advantage on heavy, plastic clays. Upon such, ashes of this character have an ameliorating effect by lightening and mellowing and otherwise beneficially affecting the mechanical condition of the soil.

CALCAREOUS DEPOSITS FROM BRITISH COLUMBIA.

Deposits of tufa-like appearance, with a semi-crystalline, more or less honey-comb structure, occur not infrequently in various parts of the country in or adjacent to the so-called dry belt of British Columbia. As a rule this material is reported as found in the valleys or canyons, apparently issuing from the hillside as a plastic mass, covering possibly a considerable area, and subsequently hardening by simple exposure. From an examination of one of the deposits made by the writer in the Nicola valley last summer, it is evidently formed by the evaporation of waters or springs highly charged with carbonate of lime, held in solution by carbonic acid. One correspondent writing respecting this deposit, says: 'As the growth of the vegetation in the immediate vicinity of the deposit is very vigorous, the material must be of some importance as a fertilizer.'

At the request of Mr. J. R. Anderson, Deputy Minister of Agriculture, Victoria, B.C., we have analysed specimens collected at Enderby, Okanagan Mission, Nicola Lake and East Kootenay. There was a strong similarity between these samples; with the exception of the one from Okanagan, it would have been difficult to distinguish them the one from the other.

ANALYSIS of Calcareous Deposits.

Locality.	Carbonate of Lime.	Insoluble Matter (Clay).	Oxide of Iron and Alumina.	Organic Matter, Magnesia, &c.
	p. c.	p. c.	p. c.	p. c.
Enderby	94·14	·61	·60	4·65
Nicola Lake	95·71	·63	·86	3·00
East Kootenay	95·33	·35	·65	3·67
Okanagan Mission	70·75	3·40	18·93	6·92

They are all essentially carbonate of lime, the first three mentioned in the table being very similar in composition, and of excellent quality.

As this material is usually extremely hard, it would seem that in order to make it effective agriculturally, it would be necessary to crush or grind it to a powder. But most probably the best plan would be to burn it. The resulting lime would, I think, be found very serviceable, especially on the strong clay soils, as about Enderby and Armstrong. It would be valuable to low-lying and mucky soils, which as a rule are excessively rich in organic matter and nitrogen, but deficient in mineral matter constituents.

It is of interest to note that the analysis of a second sample of the Enderby deposit, forwarded after being burnt and allowed to air-slake, gave 90·23 per cent slaked lime and 1·33 per cent oxide of iron and alumina. Its quality was such that it could be well used for making concrete, and for other building purposes.

BONE FROM WHALE.

This sample consisted of two pieces of rib bone, dry and bleached by exposure. It was forwarded from East Leicester, N.S., and accompanied by the information that there were about 20 tons of the bones procurable in the locality at a cost of $10 per ton. Our correspondent, with others, was anxious to learn how they compared with the ordinary bone meal on the market.

Analysis.

Moisture	7·41
Organic and volatile matter* (gelatine, fat, &c.)	35·95
Mineral matter (phosphate of lime, &c.)	56·64
	100·00
Phosphoric acid (equivalent to 47·33 per cent phosphate of lime)	21·68
Nitrogen	2·98

Reference to the last issue of the bulletin on Commercial Fertilizers (Inland Revenue Department) shows that the bone meals upon the Canadian market contain between 2·7 per cent and 4·7 per cent nitrogen, and from 19·0 per cent to 26·0 per cent

* Containing 14·35 per cent fat.

phosphoric acid. We may safely conclude, therefore, that as regards these essential elements, this bone does not differ in any marked degree from the bone meal generally sold, the price of which is in the neighbourhood of $25 per ton.

It has not, however, the same agricultural value of bone meal, for two reasons: its unground condition and the presence of a considerable quantity of fat. The degree of fineness and the proportion of fat in a very large measure control the rapidity with which the bone is decomposed in the soil and its plant food liberated in available form; the finer the bone and the freer from fat, the more valuable it is from the standpoint of a fertilizer.

In the event of its being impracticable to have the bones ground or treated for conversion into superphosphate, it is suggested that the bones be broken and crushed, composted with barnyard manure, wood ashes or with alkali, according to one or other of the methods outlined for the reduction of bones on the farm and described in our report for 1895. Unbroken and untreated, the bones would be of very little immediate value as a fertilizer—they would probably remain for years in the soil with but little decomposition.

THE CONTROL OF SOIL MOISTURE.

Among the several factors that go towards successful orcharding three may be mentioned which are intimately connected: (1) the control of the soil's moisture at different seasons of the year, (2) the maintenance or increase of the fertility of the soil and its mechanical improvement, and, (3) the furnishing of 'cover' to protect the roots of the trees during the winter. By cultivation, followed by the growth of a cover crop, all these objects may be attained, but as soils and climatic conditions throughout the country are not the same, it will be evident that the plan—as regards periods to be under cultivation and under crop—best adapted to one locality may require modification before giving equally good results in another.

In order to test various modifications of this system as regards soil treatment, and to obtain information as to the fertilizing value of certain new crops or new combination of crops, experiments were begun a number of years ago on the Experimental Farm, Ottawa. The results of these investigations have appeared in the annual reports of the farms. In continuing this work during the past season, we have carried on experiments at Ottawa and at Nappan, N.S., the information sought being solely with regard to the control of the soil's moisture.

Experiments at the Experimental Farm, Ottawa, Ont.

Two series of experiments were instituted; the first, to ascertain the comparative effect of cultivation and mulching on the soil's moisture; the second, to learn the relative amounts of water withdrawn by certain crops sown broadcast and in drills, respectively—in the case of the drill-sown crop the cultivation was carried on between the rows as long as practicable.

Series I.—Consisted of 5 plots, A, B and C, adjoining one another; D and E also adjoining one another, but in a different part of the orchard from the first three named. The soil of one plot (A) was to be kept in 'clean culture' throughout the season and its moisture content, compared with that of a soil carrying a growing crop of Hairy Vetch, uncut (plot B), of a soil with Hairy Vetch cut and mulched (plots C and D), and of a soil with a crop of mixed clover and Timothy (E) cut and used as mulch.

Plot A was ploughed May 6, cultivated June 10, 25, July 25.

Plot B had been sown in 1903, with Hairy Vetch, which before the close of the season had practically covered the ground. The vetch survived the winter well and during the early part of the present (1904) season produced an excellent, though somewhat patchy, growth. Towards the end of July the crop began to die and it was cut August 5, to be saved for seed.

Plots C and D differed from B only in the cutting and mulching of the Hairy Vetch. The crop was cut June 2 and left on the ground. From an observation made shortly after the cutting, it was thought that the vetch would not produce any aftermath, and that it would not long survive the cutting. This proved to be the case. The vetch rapidly died and its place was taken by a growth of Foxtail, &c. These facts are indicative of the unsuitability of Hairy Vetch if it is desired to mulch. Further, the data of these two plots as regards the effect of mulching on the moisture content must not in any sense be considered conclusive.

Plot E was in clover and Timothy, sown 1903. Throughout the season it gave but a 'thin stand,' the clover gradually disappearing. The dates of cutting are May 28, June 29, July 21, and August 17. The cut herbage was all allowed to remain as a mulch, but being very light acted poorly in that capacity.

The samples were collected every two weeks from May 9 to August 28, and were taken to a depth of 14 inches.

It will be noticed that at the outset the percentage of moisture in Plot A is considerably lower than that of the other plots of the series. Four days previous to the collection of the sample this plot had been ploughed but not disked or harrowed. This neglect resulted in a most serious drying out of the soil. When soil, and especially that which has been in sod, is left in ridges, the air freely circulates about and through it, with the effect just noted. If moisture is to be conserved it is essential that the ploughing be followed immediately by the disc and smoothing harrows. It is only thus that a fine earth mulch will be formed and evaporation checked. Although there was a very fair rainfall—one above the average, indeed—for May, this plot did not equal the others by several percentages until June 6, so seriously had its soil been dried out. There is in the results of this plot during May an important lesson alike for the farmer and the orchardist.

From the fact already referred to, that the growth of Plot B was not as uniform as could be wished, it may not be wise to discuss the details too closely. We had hoped inferences might be drawn from its data as to the relative amount of moisture withdrawn from the soil by Hairy Vetch or conserved by the shade of its foliage. As the summer may be described as both cool and wet, and as the soil was in places not entirely covered with foliage, we only feel justified in saying that the data do not indicate any great exhaustion by the Hairy Vetch of the soil moisture. Probably the loss which would otherwise ensue from the setting up of capillarity is prevented by the shade furnished by the crop, the heavy foliage, undoubtedly, would act beneficially and effectively as a mulch.

On Plot C, the crop (Hairy Vetch) was cut on June 2, and the crop left on the ground. There was not, however, a sufficiency to cover the plot and we find that as the summer advanced, moisture to some extent was lost through capillarity being established. Consequently, in July the soil of this plot was drier than that of either A or B.

The growth on Plot D was very scanty, resulting in an exceedingly thin mulch when cut, and we have, therefore, in the data, evidence of the drying out through capillarity and evaporation, especially in the latter part of June and during July.

The results of Plot E are similar in trend to those just considered, though showing a still further exhaustion of soil moisture. This was undoubtedly due to the stronger growth on Plot E, which of course, means more soil moisture lost through transpiration. Our results in 1902 and 1903 showed most emphatically the great draft made by a sod on the soil's moisture and the reduction to 4·7 per cent (July 18) was most assuredly chiefly due to the same cause, the large amount of transpiring surface.

SERIES I.—CONSERVATION of Soil Moisture—C. E. F., Ottawa, Ont., 1904

Date of Collection.	Rainfall.	Plot A. (Cultivated.) Water.			Plot B. (Hairy Vetch—Uncut.) Water.			Plot C. (Hairy Vetch—Mulched.) Water.			Plot D, (Hairy Vetch—Mulched.) Water.			Plot E. (Clover and Timothy Mixture—Mulched.) Water.		
		Per cent.	Per acre.		Per cent.	Per acre.		Per cent.	Per acre.		Per cent.	Per acre.		Per cent.	Per acre.	
			Tons.	Lbs.		Tons.	Lbs.		Tons.	Lbs.		Tons.	Lbs.		Tons.	Lbs.
May 9	*3·97	8·56	189	1,002	12·45	310	1,973	10·74	243	1,139	12·81	297	823	11·51	263	608
" 23	1·97	11·98	275	1,037	12·37	285	1,508	14·55	344	1,494	13·02	303	34	13·92	327	700
June 6	2·95	13·58	318	196	13·23	308	1,299	13·78	323	1,063	12·24	282	550	13·71	321	1,253
" 20	·59	10·83	245	1,717	10·24	230	1,873	12·48	288	1,315	8·88	197	553	6·60	143	90
July 4	1·41	14·18	334	946	16·07	387	1.183	12·80	296	1,144	7·06	153	1,544	7·44	162	1,428
" 18	·86	15·29	364	1,586	14·17	334	400	11·36	259	876	8·94	198	1,489	4·70	99	1,669
Aug. 1	1·81	17·18	419	1,846	14·88	353	1,745	13·54	317	29	12·38	286	34	11·08	252	482
" 15	·40	13·53	316	1,487	10·52	237	1,987	8·49	187	1,616	6·26	135	474	7·90	173	1,274
" 29	2·40	14·39	340	522	12·53	289	1,959	12·72	295	567	10·35	233	1,407	10·59	239	1,530

* From April 1 to May 9.

SERIES II.—CONSERVATION of Soil Moisture—C. E. F., Ottawa, Ont., 1904.

Date of Collection.	Rainfall.	Plot M. — (Buckwheat, broadcast.) Water.			Plot N. — (Peas, in Drills.) Water.			Plot O. — (Hairy Vetch, broadcast.) Water.			Plot P. — (Hairy Vetch, in Drills.) Water.			Plot Q. — (Soja Beans, in Drills.) Water.			Plot R. — (Horse Beans, in Drills.) Water.		
		Per cent	Per acre.		Per cent	Per acre.		Per cent	Per acre.		Per cent	Per acre.		Per cent	Per acre.		Per cent	Per acre.	
			Tons.	Lbs.		Tons.	Lbs.		Tons.	Lbs.		Tons.	Lbs.		Tons.	Lbs.		Tons.	Lbs.
July 4	*1·41	11·20	258	1,630	8·86	199	969	8·42	188	1,334	11·77	273	1,488	11·91	277	881	11·45	265	678
" 18	·86	10·75	247	331	8·30	135	1,469	7·78	173	243	11·24	259	1,645	11·11	256	951	11·14	257	504
Aug. 1	1·81	10·81	248	1,421	10·45	239	922	10·19	232	1,654	13·31	315	2	13·51	320	1,068	12·77	300	813
" 15	·40	4·31	92	852	5·08	109	1,644	4·95	106	1,731	9·48	214	1,812	11·56	268	443	8·70	190	124
" 29	2·40	11·60	269	543	8·90	200	948	7·58	168	601	12·80	301	443	10·20	233	163	10·06	230	988
Sept. 12	1·40	11·80	274	1,670	9·42	213	808	9·02	203	888	13·82	329	137	12·12	283	14	10·43	238	1,899
" 26	2·71	12·97	305	1,625	12·30	287	1,599	12·08	281	1,889	14·29	342	251	14·66	358	729	15·31	365	113
Oct. 10	3·00	11·37	263	495	10·39	237	1,854	10·38	237	1,365	13·51	320	1,068	14·11	337	216	11·92	277	1,410

From June 20 to July 4.

Series II.—The purpose in establishing this series of plots (M, N, O, P, Q, R,) was to ascertain the relative degree to which certain crops reduced the soil's moisture by their growth and, further, to gain information regarding the soil's moisture content when the same crop is sown broadcast and in drills. With respect to this latter feature it may be pointed out that the broadcasted crop may be supposed to conserve moisture by shading the soil; while with the crops growing in drills, cultivation may be practiced with the same object. We wished to learn which of these was the most effective.

The investigation was carried on between July 4 and October 10, the collection of samples being made fortnightly to a depth of 14 inches.

The crops (see table) were sown on June 27, and the cultivations of those sown in drills were made on July 16 and 27, and August 12.

Unfortunately, owing to the initial moisture contents of Plots N and O being considerably less than that of the others, we are unable to compare the percentages throughout the series. By comparing the losses or gains of one plot with those of another, however, some idea may be gained as to the relative effect on the soil's moisture by the different methods under trial, and it is this plan we shall follow in considering the data of this series.

Reference has already been made to the nature of the season. It will be noticed from the tabulated data that with the exception of the fortnight ending August 15, no period (of two weeks) passed without an ample precipitation. This fact renders the results, from the standpoint we are considering them, of much less value than if the summer had been dry and warm. The results of this heavy rainfall, for instance, increased the moisture of all the plots between July 18 and August 1, though at that time they were carrying vigorously growing crops.

Between August 1 and 15, slightly less than half an inch of rain fell, and it might, therefore, prove instructive to make a comparison of the plots on that date. The losses between July 4 and August 15 were as follows:—

Plot M.—With a good crop of buckwheat the loss was 6·89 per cent, or 166 tons per acre.

Plot N.—This was in pease, but the growth was not very good, much of the land being occupied by weeds. The loss was 3·78 per cent, or 90 tons per acre.

Plot O.—Hairy Vetch, broadcast, good growth. The loss was 3·47 per cent., or 82 tons per acre.

Plot P.—Hairy Vetch, in drills, and cultivated between rows. The loss was 2·29 per cent, or 59 tons per acre.

Plot Q.—Soja Beans, in drills, and cultivated, not a heavy growth. The loss was only 0·39 per cent, or 9 tons per acre.

Plot R.—Horse Beans, in drills, and cultivated. The loss was 2·75 per cent, or 75 tons per acre.

Without reading too much into these results we may safely conclude that the buckwheat extracted the most moisture, and this conclusion, as regards the effect of a grain crop in drying out the soil, received confirmation by the data obtained from the growth of a crop of oats as instanced in the Nappan experiments, hereafter to be discussed.

Comparing the effect of Hairy Vetch broadcast and in drills, there is a notable difference in favour of the latter method when it is desired to minimize the loss of moisture.

With Soja Beans, in drills, the loss had been insignificant, though during the succeeding fortnight, August 15-29, the moisture fell off a little, probably owing to increase in foliage. On this plot, however, the moisture content was remarkably constant throughout the whole period of the experiment.

With the exception of the remarkable and unaccountable loss of moisture in the plot with Horse Beans, the results of August 15 clearly indicate that much moisture may be saved by sowing the crops in drills and cultivating between the rows from time to time throughout the summer months.

CONSERVATION of Soil Moisture, Nappan, N. S., 1904.

Date of Collection.	Rainfall.	Plot 1. Water. Per cent.	Plot 1. Water. Per acre.		Plot 2. Water. Per cent.	Plot 2. Water. Per acre.		Plot 3. Water. Per cent.	Plot 3. Water. Per acre.		Plot 4. Water. Per cent.	Plot 4. Water. Per acre.		Plot 5. Water. Per cent.	Plot 5. Water. Per acre.	
	Inches.		Tons.	Lbs.		Tons.	Lbs.		Tons.	Lbs.		Tons.	Lbs.		Tons.	Lbs.
May 12	*3·09	18·41	406	1,417	20·00	450	1,231	18·09	398	155	20·83	475	1,350	18·93	420	1,757
" 26	1·50	17·21	374	1,375	18·02	396	398	18·43	407	500	21·21	484	1,165	18·97	421	1,952
June 9	·97	12·52	257	1,931	17·84	391	642	19·24	429	826	20·31	459	1,904	14·04	294	799
" 23	1·60	10·46	210	1,125	17·40	379	1,391	17·71	387	1,832	20·46	463	1,292	11·65	237	1,352
July 7	·03	9·06	179	1,144	16·70	361	715	17·46	381	563	19·14	426	1.304	11 22	227	1,590
" 21	·46	7·46	145	606	13·43	279	1,247	16 35	352	609	20·54	465	1,855	12·06	247	376
Aug. 4	1·05	8·23	161	1,292	9·49	188	1,977	15·10	320	1,159	18·11	398	1,230	10·36	208	633
" 18	1·15	9·80	195	1,666	10·30	212	1,091	15·71	335	1,887	20·26	457	1,924	13·66	285	341
Sept. 6	3·55	17·79	390	95	16·99	368	1,835	20·13	454	566	24·04	570	895	20·22	456	1,657
" 20	1·26	14·91	315	1,677	16·31	351	549	17·99	395	789	18·09	398	155	19·87	446	1,921
Oct. 31	6·94	21·33	488	1,413	19 77	444	313	21·42	491	662	26·02	633	1,913	19·71	442	669

* Total amount of rainfall from April 9 to May 12.

Experiments at Experimental Farm, Nappan, N.S.

As already stated, the treatment of an orchard soil, with respect to the control of its moisture-content, will naturally be largely regulated by the climatic conditions likely to prevail in the district. Thus, we find that the practice in the Niagara district and west, in regard to the time of ploughing under the cover crop, &c., differs, and rightly so, from that in vogue in eastern Ontario and Quebec. Recognizing this, the value of data from experiments similar to those carried on in the orchards at Ottawa for some years past, but obtained in the various fruit-growing areas of the Dominion, will be obvious. With this in mind, a series of experiments was conducted during the past season on the Experimental Farm, Nappan, N.S. The work in connection therewith at Nappan was conducted by Mr. W. S. Blair, the Horticulturist, who in his report is giving full details regarding the plots, their treatment and the results obtained; the moisture determinations were made in the farm laboratory, Ottawa. These latter are given in the subjoined table, being expressed as percentages and as tons per acre to a depth of 14 inches of soil. We purpose merely to utilize these data here in so far as they may furnish information relating to the effect of crops in general and clean cultivation on the soil's moisture-content.

Plots adjoining one another on soil of uniform character, clay on clay subsoil.

Plot 1.—Seeded to Winter Rye and Clover in autumn of 1903. Rye harvested August 3, 1904, crop standing 55 inches. Clover made but poor growth and was not entirely covering the ground when the season closed.

Plot 2.—Seeded to Crimson Clover in 1903, which was winter killed. Ploughed May 26, 1904, worked and seeded with oats June 20.

Plot 3.—Seeded to Crimson Clover, 1903, which was winter killed. Ploughed May 13, worked and cultivated May 29, June 20 and 29. Seeded to Alfalfa July 7, which made a strong growth, 12 inches high, before the close of the season.

Plot 4.—Seeded to Crimson Clover in 1903, which was winter killed. Ploughed May 13, 1904, disked and harrowed May 29, June 20 and 29, July 7, 13, 25. Crimson Clover sown July 25. This made excellent growth.

Plot 5.—Seeded to Oats, Mammoth Red and Alsike Clovers and Timothy, in spring of 1903. It made excellent growth and was cut for green feed. In 1904 the growth of clover was good; it was cut and fed June 23. A matt of growth 5 to 8 inches remained at the close of the season.

THE EFFECT OF GROWING RYE ON THE MOISTURE-CONTENT OF THE SOIL

The most striking results are those from plot 1, which, as we have seen, carried a crop of rye until August 3. At the outset (May 12) the moisture-content of this soil did not differ widely from that of the others of the series. Very shortly after this date, however, this soil (No. 1) began to lose moisture, so that by June 9, in spite of the fact that 2½ inches of rain had fallen during the first month of the experiment the water-content was reduced 5·89 per cent (from 18·41 to 12·52 per cent)—equivalent to a loss of, practically, 150 tons from the first fourteen inches of soil per acre. This was, of course, due chiefly to the large amount of water used by the growing rye on this plot, but a part of this water was no doubt lost through capillarity being established (the soil not being stirred) and subsequent evaporation.

On June 23 the percentage of moisture in this soil was further reduced to 10·46, while the soils of plots 2, 3 and 4 (at this time in clean cultivation) practically maintained their initial percentages. By July 9, though an inch of rain had fallen during the preceding fortnight, the soil of this plot (No. 1) had lost another 1·5 per cent of water. The moisture-content on July 21 showed a still further reduction; it was now but 7·46 per cent, practically one-half of that in soils of plots 2 and 3, and but one-third of that of plot 4. The comparison between the moisture-content of soils in crop

and under cultivation during this season of the year (May 12 to July 21), *i.e.* between the results from plots 1 and 2, makes it evident that there was lost from the soil bearing the crop, practically 90 tons per acre *more* water (equivalent to 9 inches of rain) than from the soil under cultivation. It is during this period that the fruit tree makes its growth. For this, as well as for the development of its fruit, it is essential that there should be a sufficiency of soil moisture at this time in the orchard soil, and our present results indicate most clearly how the trees may be robbed of this moisture by a growing crop of grain. The condemnation of this practice of taking a grain crop from the orchard is most certainly emphasized by the results of this investigation.

THE EFFECT ON THE MOISTURE-CONTENT BY VARYING PERIODS OF CULTIVATION.

By reference to the brief description of the plots 2, 3 and 4, it will be observed that their respective treatment differs in the length of time during which cultivation was continued. With plot No. 2 this period was from May 26 to June 20; with No. 3, from May 13 to July 7, and with No. 4, from May 13 to July 25.

During the month of June, as might be expected, the moisture-content of all three plots is fairly constant; the cultivation evidently was effective in preventing the drying out of the soil, which we have seen was so marked at this period in plot No. 1.

After June 20 cultivation ceased, however, on plot 2, and immediately the soil began to lose moisture. This loss became greater and greater as the season advanced, owing to the increased demands of the crop (sown June 20). On August 18 this soil showed 5 per cent less moisture than plot 3 and 10 per cent less than plot 4. Towards the end of August heavy rains set in which served to equalize the moisture-content of all the plots.

From the fact that plot No. 3 was cultivated till July 7, we find the percentage of moisture in this soil fell but little to that date, the decline from the beginning of the experiment being from merely 18·09 per cent to 17·45 per cent. As the Alfalfa on this plot (sown July 7) grew, soil moisture was utilized and the percentage correspondingly reduced.

The results of plot No. 4 are in accord with those of Nos. 2 and 3: that is, they furnish additional evidence regarding the effect of cultivation in conserving moisture. The water present in this soil, cultivated to July 25, was practically unchanged till the first week of August, when it fell about 2 per cent.

We may safely conclude from a consideration of these three plots (2, 3 and 4), that the later the cultivation is continued the less falling off in soil moisture will there be as the season advances. These results may also serve to remind us that cultivation should not be continued into the autumn, or late growth will be stimulated and the due ripening of the wood prevented before winter sets in.

In plot No. 5, we have an example of a soil bearing a crop (principally clover) throughout the season. The reduction in moisture-content during the month of June was almost equal to that of plot 1, carrying a crop of Winter rye. The cutting of this plot (No. 5) on June 23, undoubtedly checked this loss of moisture, but it did not altogether prevent it, as evident by the data of August 4, which showed that the moisture at that date had been reduced to 10·36 per cent—practically 8 per cent less than that of plot 4.

INOCULATION FOR THE GROWTH OF LEGUMES.

We have received during the past two months numerous inquiries from all parts of Canada on this subject. This re-awakened interest in the matter of inoculation is undoubtedly due to the wide publicity given to the new cultures now being prepared and distributed by the Bureau of Plant Industry, Washington, D.C., U.S. A beautifully illustrated article in *Scribners* monthly for October, setting forth in popular language the claims made for these cultures and the results that have been obtained, is particularly answerable for the present demand for inoculating material. It has

become necessary, therefore, to make a brief statement as to what has been done in this important research by the Experimental Farms and our present position as regards the necessity or desirability of generally distributing the cultures.

1. For many years we carried on experiments, both in pots and in the field, with cultures of nitrogen-assimilating bacteria, prepared in Germany, publishing the results in the Experimental Farms reports (1897-8-9). In certain instances it was found that the cultures favoured the growth of legumes, clover, beans, &c., but there was not sufficient evidence to justify us in recommending them for general use. The cultures were found particularly susceptible to light and heat, and under the best conditions of preservation their vitality could only be guaranteed for six weeks from the date of their preparation. It was felt that the matter was still in the experimental stage, and for the reasons just stated it was not desirable to make any general distribution of the cultures.

Since these experiments were made, the preparation of the cultures, known as Nitragin, has been discontinued, owing, we presume, to lack of sufficient demand for the preparations.

Last spring we were kindly supplied by the authorities at Washington with samples of their new cultures for Red clover and Alfalfa. It is claimed for these cultures that by reason of the method employed in their preparation and the mode in which they are sent out, they are more potent and more stable than the cultures formerly made in Germany. We experimented with these preparations, using pots filled with sterilized soil. The directions issued with the cultures were carefully followed. While it is true that nodules were found on many of the plants growing in the inoculated pots, these nodules were few and of small size and no general increase in the weight of the crop was to be observed as a result of the use of the cultures. Further, as nodules developed on plants in two of the control (uninoculated) pots, we were unable to decide if the cultures had been effective or not. It is certainly to be regretted that the results this year have not been more satisfactory, but at present, from our own experience we cannot report very favourably. Further trials will be made next season, both in pots and in the field, and the results made known in due course.

The attention of farmers may be drawn to the fact that effective inoculation for clover and Alfalfa may be obtained by the use of a certain amount of the soil from fields growing good crops of these plants. This method has proved most successful. Such soil is not difficult to obtain in all the provinces save, perhaps, Manitoba and the North-west Territories. Directions for using such soils have from time to time been issued by us.

For many years past, as is well known, particular attention has been paid by us to the system of soil enrichment by the growth of legumes and to the various means that could be taken to obtain a vigorous growth of the crop. In this connection I should like to add that our experience and observation have shown that the necessity of inoculation is not so great as was at one time thought. We are led to believe that the existence of the bacteria that serve to fix the nitrogen in the legume is by no means restricted to small or isolated areas. We have found—at all events in Ontario and the eastern provinces—that failures in the past to obtain a good catch of clover have been due rather to deficiency of moisture, or unsuitable mechanical condition of the soil, or insufficient drainage, than to the absence of nitrogen-assimilating germs. The general—though probably not universal presence of root nodules on the clover in Ontario and the east lead us to believe that special means for inoculation have not been necessary save, perhaps, in exceptional instances in the aforementioned provinces. It was due to these facts, we consider, that there has been no general demand for inoculating material.

In my recent tour through British Columbia, I found these organisms present upon every root of clover examined, and I took especial care to obtain information upon this matter in all the agricultural districts I visited. The same stands true alike for the irrigated soils of the dry belt (Nicola and Okanagan valleys), as well as for

the lower Fraser and the coast soils and those of Vancouver Island. The luxurious crops of clover observable in British Columbia almost everywhere this year convinced me that inoculation was not generally necessary in this province.

My impression is that the severity of the winter, lack of sufficient moisture, and an uncongenial condition of the soil, or poor seed, will be found to militate more against successful clover growing than any supposed lack of the nodule bacteria, though I would not say that artificial inoculation would not be advantageous in certain districts.

It would seem from certain inquiries received lately from farmers that there is an impression abroad that the benefit to be derived from the nitrogen-fixing bacteria can be obtained directly from inoculation of the soil, *i.e.,* without the agency of the clover crop. This is, of course, erroneous. It is only through the growth of the clover (or other legume) and the subsequent decay in the soil of its roots (or whole plant) that the soil is enriched in humus and nitrogen. It is obvious, therefore, that where clover grows luxuriantly inoculation is unnecessary. We feel safe in saying that the roots of such clover will be found plentifully supplied with nodules.

FODDERS AND FEEDING STUFFS.

FODDER CORN, AS GROWN IN HILLS AND DRILLS.

The feeding value of the corn crop at various stages of growth was determined in the Farm Laboratories in 1896 and the results published in the report of the Chemical Division for that year. Amongst other interesting facts brought out by that research, it was shown that there was a very large increase of nutrients to be obtained simply by allowing the corn to come to the 'glazing' condition before cutting for the silo or for curing in the field as a fodder. This condition or stage of growth is not reached when the corn is sown broadcast, and hence the method of planting in hills or drills was strongly recommended. The question has since arisen : Which produces the greater weight per acre of real cattle food, corn planted in hills or drills ?

To obtain information on this point the investigation now discussed was begun in 1901 and continued during the seasons 1902 and 1903. We have consequently three years' data from which deductions may be made. Two varieties of Dent corn, Selected Leaming and Mammoth Cuban, and a similar number of Flint varieties—the Longfellow and Canada White—were chosen and planted in hills and drills respectively, this part of the investigation being conducted on the experimental plots of the Experimental Farm at Ottawa.* When the respective corn had reached the 'glazing' stage, or as near as the season would permit to that condition, it was cut, the weight per acre ascertained and samples taken for analysis.

The analytical data in detail are given at the close of this article, and are of considerable value in showing the variations in composition that may occur from various causes from year to year in the same variety, and in throwing light upon several other matters of equal interest connected with the growth of the plant. For the purpose of our present inquiry, however, the problem will be much simplified if we consider merely the averages obtained from these results.

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*The drills were 35 inches apart, with 6 to 8 inches between the plants. The hills were also 35 inches apart, with an average of four to five kernels in a hill.

Composition of Corn Fodder (fresh material)—Four Varieties, Average of 3 Years.

	Hills.	Drills.
Water	80·81	79·05
Dry matter	19·19	20·95
	100·00	100·00
*Crude protein	1·55	1·50
Fat	·08	·07
Carbo--hydrates (nitrogen-free extract)	11·04	12·31
Fibre	5·38	5·91
Ash	1·14	1·15
*Nitrogenous substances—		
Albuminoids	6·96	6·29
Non-albuminoids	1·28	6·29

Fresh Material.—Compared weight for weight, the fodder produced in drills contains slightly more dry matter, the increase being in the carbo-hydrates (starch, &c.) and the fibre.

In the more important nutrient, crude protein, the fodder from the hills is very slightly the richer, and this relation holds good on further analysis of the nitrogenous bodies, the percentage of albuminoids or true flesh formers being somewhat lower in the corn grown in drills. These differences, with the exception of that relating to the dry matter, are, however, exceedingly small and cannot in themselves be considered of any great significance from the feeding value standpoint.

Composition of Corn Fodder (dry matter)—Four Varieties, Average of 3 Years.

	Hills.	Drills.
*Crude protein	8·24	7·22
Fat	·42	·35
Carbo-hydrates (nitrogen-free extract)	57·64	59·43
Fibre	27·76	27·40
Ash	5·94	5·60
*Nitrogenous substances—		
Albuminoids	6·96	6·29
Non-albuminoids	1·28	·93

Dry Matter.—The only difference worthy of special notice here is the percentage of protein, which is somewhat higher in the case of the hill-grown corn. This, as might be expected, is accompanied by a correspondingly lower percentage of carbo-hydrates. In albuminoids (the more valuable part of the crude protein), the dry matter of the fodder from the hills is about three-quarters of a per cent (·75 per cent) the richer.

In summing up the data of the investigation so far discussed, it seems justifiable to conclude that the fodder from the corn planted in drills is slightly the more valuable by reason of its larger proportion of dry matter, but that in albuminoids (the true flesh formers) the hill-grown fodder is a little the richer.

We may now consider the data of the yields per acre and thus arrive at an answer to the question which was the occasion and incentive of this investigation.

Yield and Weight of Nutrients per Acre—Four Varieties, Average of 3 Years.

	Hills.		Drills.	
	Tons.	Lbs.	Tons.	Lbs.
Weight of crop	18	146	19	162
Dry matter	3	1,123	4	60
*Crude protein	..	564	..	583
Fat	..	28	..	30
Carbo-hydrates (nitrogen-free extract)	2	74	2	732
Fibre	1	30	1	254
*Nitrogenous substances—				
Albuminoids	..	488	..	507
Non-albuminoids	..	76	..	76

First, in regard to yields, the average obtained from the crops of three successive seasons was one ton more per acre from the corn planted in drills. This increase in yield means 937 lbs. more of dry matter per acre, composed of 19 lbs. protein (albuminoids), 658 lbs. carbo-hydrates, 2 lbs. fat, 224 lbs. fibre and 34 lbs. ash.

In spite, therefore, of the slightly higher feeding value of the dry matter of the hill-grown corn (due to its containing more protein), more real cattle food was obtained per acre from the corn in drills, by reason of the latter giving a larger yield of fodder containing a higher percentage of dry matter.

We do not wish to exaggerate the differences here indicated in favour of planting in drills. Though significant, they are by no means large, and it is quite possible that with other varieties of corn they might be considerably modified. The general impression among those who have planted in both ways is that hill-grown corn produced the larger number of ears, and the analysis bears out this contention; the larger yield obtained from the drills, however, more than offsets this advantage.

Dent and Flint Varieties.—It will be remembered that two Dent and two Flint varieties were employed in this research, consequently the data obtained may serve to make a comparison between Dent and Flint corn as regards yield of fodder and the relative value of that fodder.

Composition of Corn Fodder, Dents and Flints, two Varieties of each from Drills and Hills, Average of 3 Years.

Constituents.	Fresh Material.		Dry Matter.	
	Dents.	Flints.	Dents.	Flints.
Water	80·22	79·64		
Dry matter	19·78	20·36		
Crude protein	1·41	1·63	7·23	8·12
Fat	0·78	0·09	0·35	0·44
Carbo-hydrates	11·54	11·91	58·19	58·99
Fibre	5·64	5·56	28·43	26·72
Ash	1.12	1·16	5·73	5·73
Nitrogenous substances, Albuminoids	1·24	1·41	6·35	6·91
Non-albuminoids	0·17	0·22	0·88	1·21

The fodder (fresh material) of the Flint varieties, compared weight for weight with that from the Dents, is seen to contain the larger amount of dry matter. The difference is not a large one, but the superiority of the 'Flint' fodder is still further emphasized by the fact that its dry matter is richer in albuminoids and possesses less fibre.

In the second table, to be found on page 168, we present the data of the yields and weights of nutrients per acre from the Flint and Dent varieties examined.

Indian Corn as grown in Hills and Drills. Composition of fresh material and water-free substance.

Variety.	Hills or Drills.	Date of Sowing.	Date of Collection.	Fresh Material.								Water-free Substance.						
				Water.	Fat.	Fibre.	Nitrogen—free extract.	Protein. Crude.	Protein. Albuminoids.	Protein. Non-albuminoids.	Ash.	Fat.	Fibre.	Nitrogen—free extract.	Protein. Crude.	Protein. Albuminoids.	Protein. Non-albuminoids.	Ash.
				p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
Selected Leaming.....	Drills..	May 28, 1901.	Sept. 21, 1901.	77·34	0·04	6·83	13·41	1·28	1·23	0·05	1·10	0·16	30·15	59·15	5·67	5·43	0·24	4·87
"	Hills...	" 28, 1901.	" 21, 1901.	82·05	0·06	4·77	10·99	1·26	1·23	0·03	0·87	0·35	26·60	61·17	7·04	6·83	0·21	4·84
"	Drills..	" 27, 1902..	" 24, 1902.	80·43	0·14	5·72	10·44	1·81	1·39	0·42	1·46	0·71	29·25	53·36	9·27	7·09	2·18	7·41
"	Hills...	" 27, 1902..	" 24, 1902.	84·14	0 06	4·67	8·22	1·62	1·34	0·28	1·29	0·35	29·47	51·85	10 21	8·44	1·77	8·12
"	Drills..	" 27, 1903..	" 24, 1903.	81·08	0·05	4·31	12·39	1·28	1·16	0·12	0·89	0·25	22·77	65·42	6·79	6·14	0·65	4·77
"	Hills...	" 27, 1903..	" 24, 1903.	81·27	0·09	4·69	11·41	1·46	1·29	0·17	1·08	0·49	25·02	60·89	7·81	6·89	0·92	5·79
Mammoth Cuban.....	Drills..	" 28, 1901..	" 21, 1901.	77·31	0·02	8·04	12·49	1·04	1·01	0·03	1·10	0·08	35·45	55·03	4·60	4·46	0·14	4·84
"	Hills...	" 28, 1901..	" 21, 1901.	80·13	0·01	7·35	10·22	1·10	1·05	0·05	1 19	0·04	37·00	51·40	5·55	5·30	0·25	6·01
"	Drills..	" 27, 1902..	" 24, 1902.	79·00	0·07	6·33	11·51	1 75	1·48	0·27	1·34	0·33	30·15	54·82	8·33	7·03	1·30	6·37
"	Hills...	" 27, 1902..	" 24, 1902.	80·40	0·08	5·60	11·04	1·66	1·37	0·29	1·22	0·40	28·59	56·31	8·54	6·99	1·55	6·16
"	Drills..	" 27, 1903..	" 24, 1903.	79·09	0·09	4·58	14·08	1·21	1·05	0·16	0·95	0·41	21·91	67·37	5 79	5·01	0·78	4·52
"	Hills...	" 27, 1903..	" 24, 1903.	80·42	0·11	4·87	12·03	1·56	1·29	0·27	1·01	0·56	24·89	61·43	7·96	6·58	1·38	5·16
Longfellow..........	Drills..	" 28, 1901..	" 21, 1901.	73·58	0·18	9·88	13 42	1·69	1·60	0·09	1·25	0·67	37·39	50·81	6·39	6·06	0·33	4·74
"	Hills...	" 28, 1901..	" 21, 1901.	79·40	0·09	6·31	11·56	1·56	1·46	0·10	1·10	0·42	30·62	56·04	7·57	7·09	0·48	5·35
"	Drills..	" 27, 1902..	" 24, 1902.	79·19	0·04	5·70	11·42	1·94	1·52	0·42	1·71	0·18	27·41	54·87	9·33	7·31	2 02	8·21
"	Hills...	" 27, 1902..	" 24, 1902.	80·48	0·08	5·52	10·58	1·90	1·42	0·48	1·44	0·40	28·28	54·19	9·75	7·27	2·48	7·38
"	Drills..	" 27, 1903..	" 24, 1003.	80·11	0·08	3·81	13·59	1·52	1·31	0·21	0·89	0·39	19·15	68·33	7·65	6·59	1·06	4·48
"	Hills...	" 27, 1903..	" 24, 1903.	79·34	0·21	4·65	12·99	1·82	1·57	0·25	0·99	1·03	22·49	62·88	8·83	7·58	1·25	4·77
Canada White	Drills..	" 28, 1901..	" 21, 1901.	79·00	0·13	5·84	12·10	1·78	1·63	0·15	1·15	0·62	27·80	57·62	8·49	7·75	0·74	5·47
"	Hills...	" 28, 1901..	" 21, 1901.	75·76	0·01	8·28	12·82	1·69	1·61	0·08	1·44	0·03	34·16	52·83	7·03	6·64	0·39	5·95
"	Drills..	" 27, 1902..	" 24, 1902.	80·41	0·04	5·35	11·48	1·52	1·24	0·28	1·20	0·18	27·29	58·59	7·74	6·34	1·40	6·20
"	Hills...	" 27, 1902..	" 24, 1902.	81·65	0·08	4·57	10·92	1·62	1·26	0·36	1·16	0·45	24·90	59·53	8·85	6·85	2·00	6·27
Sanford	Drills..	" 27, 1903..	" 24, 1903.	82·15	0·05	3·59	12·24	1·19	1·13	0·06	0·78	0·30	20·11	68·60	6·64	6·31	0·33	4·35
"	Hills...	" 27, 1903..	" 24, 1903.	84·70	0·09	3·24	9·80	1·32	1·07	0·25	0·85	0·57	21·16	64·14	8·60	7·02	1·58	5·53

INDIAN CORN as grown in Hills and Drills. Yield and Weight of Nutrients per Acre.

Variety.	Hills or Drills.	Date of Sowing.	Date of Collection.	Weight of Crop.		Dry Matter.	Fat.	Fibre.	Nitrogen—free extract.	Protein.			Ash.
										Crude.	Alluminoids.	Non-Alluminoids.	
				Tons.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Selected Leaming.	Drills ..	May 28, 1901	Sept. 21, '01	22	..	9,970	18	3,005	5,900	563	541	22	484
" " .	Hills...	" "	" "	23	860	8,411	28	2,235	5,150	590	576	14	408
" " .	Drills ..	May 27, 1902	Sept. 24, '02	23	1,300	9,257	68	2,706	4,937	856	657	199	690
" " .	Hills...	" "	" "	17	980	5,548	21	1,634	2,875	567	469	98	451
" " .	Drills ..	May 27, 1903	Sept. 24, '03	17	1,970	6,806	18	1,550	4,453	460	417	43	320
" " .	Hills...	" "	" "	16	10	5,996	29	1,501	3,453	467	413	54	346
Mammoth Cuban.	Drills ..	May 28, 1901	Sept. 21, '01	19	940	8,836	8	3,131	4,864	405	393	12	428
" " .	Hills...	" "	" "	26	140	10,360	5	3,832	5,328	574	547	27	621
" " .	Drills ..	May 27, 1902	Sept. 24, '02	22	1,320	9,517	32	2,869	5,216	793	671	122	607
" " .	Hills...	" "	" "	17	1,640	6,986	29	1,996	3,934	592	488	104	435
" " .	Drills ..	May 27, 1903	Sept, 24, '03	19	1,600	8,280	36	1,814	5,575	479	416	63	376
" " .	Hills...	" "	" "	19	775	7,592	43	1,888	4,601	605	500	105	465
Longfellow.......	Drills ..	May 28, 1901	Sept. 21, '01	15	360	8,021	55	2,999	4,074	513	486	27	380
"	Hills...	" "	" "	20	40	8,248	36	2,527	4,620	625	585	40	440
"	Drills ..	May 27, 1902	Sept. 24, '02	22	1,320	9,432	18	2,583	5,177	879	689	190	775
"	Hills...	" "	" "	17	1,640	6,957	29	1,967	3,771	677	506	171	513
"	Drills ..	May 27, 1903	Sept. 24, '03	15	1,240	6,214	25	1,190	4,246	475	409	66	278
"	Hills...	" "	" "	14	1,260	6,045	61	1,361	3,800	533	459	74	290
Canada White....	Drills ..	May 28, 1901	Sept. 21, '01	18	1,840	7,946	49	2,210	4,578	674	617	57	435
" "	Hills...	" "	" "	17	100	8,266	3	2,824	4,372	576	549	27	491
" "	Drills ..	May 27, 1902	Sept. 24, '02	17	760	6,809	14	1,860	3,990	528	431	97	417
" "	Hills...	" "	" "	18	1,400	6,863	30	1,709	4,084	606	471	135	434
Sanford	Drills ..	May 27, 1903	Sept. 24, '03	15	1,570	5,636	16	1,133	3,865	376	357	19	246
"	Hills...	" "	" "	13	1,500	4,208	25	891	2,695	363	294	69	234

CORN FODDER, Dents and Flints—Two Varieties of each from Drills and Hills—Yield and Weights of Nutrients per Acre.

—	Dents.		Flints.	
	Tons.	Lbs.	Tons.	Lbs.
Yield of crop..........	20	961	17	585
Dry matter..........	4	129	3	1,053
Crude protein..........	....	580	....	569
Fat..........	....	28	....	30
Carbo-hydrates..........	2	707	2	107
Fibre..........	1	346	....	1,938
Ash..........	....	469	....	411
Nitrogenous substances—				
Albuminoids..........	....	508	....	488
Non-albuminoids..........	....	72	....	81

Notwithstanding the better quality of the dry matter furnished by the Flint corns, the Dent varieties must certainly be considered as easily first from the standpoint of the value of the fodder produced per acre. Thus, the Dents gave an increase in yield of 3 tons 376 lbs., containing 1,076 lbs. of dry matter over the product of the Flint varieties. This increase in dry matter is chiefly in carbo-hydrates (600 lbs.) and fibre (400 lbs.), but also possesses a notable amount (20 lbs.) of the more valuable albuminoids.

RAPE, RAPE ENSILAGE, RAPE AND CORN ENSILAGE.

Rape is better known and more widely grown in Canada to-day than ever before, so that now it occupies an important position among the succulent forage crops.* Its use, so far, has been in the fresh condition, being consumed either on the field by the stock (sheep, swine and steers), or cut and used as a soiling crop. On account of its leaves crumbling to powder on drying, rape cannot be cured as hay, and by reason of its large percentage of water, it was considered unsuitable for ensiling. This latter, however, has been disproved by the experiments of Mr. Grisdale, the Agriculturist, who during the past season made ensilage solely of rape and also a mixture of corn and rape, both being found at the end of six months sound and very palatable to cattle. These ensilages were used in a feeding experiment by the Agriculturist, and the results obtained will be found in his report for the current year.

To supplement these results and to learn what changes might take place by the ensiling of the rape, certain analyses have been made. These analyses, further, allow us to compare the composition of fresh rape, rape ensilage, and an ensilage composed of half rape and half corn.

RAPE, Rape Ensilage and Rape and Corn Ensilage. (Results on the fresh material.)

Constituents.	Rape as put in the silo, Oct. 6, 1903.	Rape Ensilage, Mar. 18, '04.	Rape and Corn Ensilage, ½ Rape, ½ Corn, Mar. 18, '04.
	p.c.	p.c.	p.c.
Water	86·05	78·19	79·66
Crude protein	1·91	2·67	2·18
Fat	0·16	0·84	0·37
Carbo-hydrates	8·11	12·93	10·40
Fibre	2·33	2·00	5·29
Ash	1·44	3·37	2·10
Nitrogenous compounds (crude protein)—			
Albuminoids	1·30	1·36	1·04
Non-albuminoids	0·61	1·31	1·14

First, comparing rape with rape ensilage, we notice that ensiling the crop has resulted in a large loss of water, increasing the percentage of total dry matter from 13·95 to 21·81. Weight for weight, then, we should expect the rape ensilage to have a considerably higher feeding value. This, of course, is not to be interpreted as meaning that the rape increases in value in the silo, that a given weight of green rape gives an equal weight of ensilage with an increased percentage of dry matter, for such is not the case. The fermentation that ensues in the silo necessarily means loss in certain of the nutrients (especially the carbo-hydrates); this is true of all ensiled crops. But comparing equal weights of green rape and rape ensilage, the latter is the much more valuable. This will be further apparent by continuing the comparison of the two analyses. In crude protein the ensilage is considerably the richer. This gain,

*For an account of the food value of this crop, see the article, 'The Chemistry of Rape,' in report of this Division for 1900. Bulletin No. 42 (Experimental Farm Series) furnishes information respecting its culture and use.

however, is more apparent than real, for by reference to the percentage of albuminoids—the part of the crude protein which has by far the greater feeding value—it is seen that it is practically identical with that of the rape. From this fact we may infer that in muscle-forming constituents the rape and its ensilage are of about the same value.

In carbo-hydrates (starch, &c.)—heat-producing constituents—the ensilage contains about one-third more, and it is in this, principally, that the greater feeding value of the ensilage lies. The fibre is almost the same in both. In fat the ensilage is higher, making it the more valuable. Lastly, as regards ash or mineral matter, the percentage in the ensilage is almost three times that in the fresh material. This does not arise, of course, from any creation of ash, but from the disappearance through decomposition of the organic constituents, leaving a higher percentage of the mineral matter.

The comparison of the rape ensilage with the rape and corn ensilage makes clear, from the chemical standpoint, the superiority of the former. In all the more valuable nutrients the rape ensilage is the richer; in fibre—the constituent of least value—the presence of the corn increases the amount in the mixed ensilage.

The average composition of corn ensilage may now be given for the purpose of comparison with the foregoing analysis of the rape and mixed ensilage.

Analysis of Corn Ensilage.

Water	79·1
Crude protein	1·7
Fat	·8
Carbo-hydrates	11·0
Fibre	6·0
Ash	1·4
	100·00

The corn ensilage, it is evident, is less valuable than either rape ensilage or that from rape and corn, in that it contains less crude protein. The difference is, of course, more marked between the rape ensilage and corn ensilage than between that of the mixed crops and the ensiled corn, but the difference is one of degree rather than of kind—the addition of corn increases proportionately the percentage of fibre while reducing that of the crude protein in the product. To sum up these considerations, there seems no doubt but that in both the rape and mixed ensilages we have a succulent feed of a more nutritious character than in an ensilage from corn alone, and this chiefly by reason of the nitrogenous character of rape and its low fibre content.

A consideration of the data calculated on a water-free basis, in other words, of the composition of the dry matter of the several materials, throws some light upon the nature and direction of the changes that take place on ensiling the rape.

RAPE, Rape Ensilage, Rape and Corn Ensilage. (Results on the water-free substance.)

Constituents.	Rape as put in the silo.	Rape Ensilage.	Rape and Corn Ensilage, ½ Rape ½ Corn.
	p.c.	p.c.	p.c.
Crude protein	13·72	12·25	10·75
Fat	1·14	3·86	1·84
Carbo-hydrates	58·14	49·27	51·05
Fibre	16·70	19·18	26·02
Ash	10·30	15·44	10·34
Nitrogenous compounds—			
Albuminoids	9·35	6·22	5·10
Non-albuminoids	4·37	6·03	5·65

The increase in the non-albuminoids and the concomitant decrease in the albuminoids that has followed upon ensiling the rape marks the most important change in the composition of the dry matter of the rape. This in conjunction with the destruction of a part of the carbo-hydrates necessarily increases the percentages of the fibre and ash. The changes are such as might have been expected and indicate a certain deterioration in the silo of the dry matter of the rape.

ROOTS.

Five years ago (1900) we began the study, from the chemical standpoint, of the relative feeding values of the more important farm roots. This work has been continued every season since that time. It has been instrumental in showing that as regards the percentages of dry matter and sugar, the two chief nutrients in determining the feeding value of roots, considerable differences may, and frequently do, exist between mangels, carrots, turnips, &c.; and, further, that between varieties of the same class similar differences may often be found. Of course, no two roots from the same seed and growing side by side are exactly alike in composition, but in this research a sufficient number of roots has been taken to practically eliminate the factors of size and individualism. It may also be remarked that in the endeavour to arrive at a knowledge of the various factors influencing the composition of these roots, the soil factor has, as far as possible, been also eliminated by growing the roots under experiment on ground of a very uniform character. The relative richness of the soil need not, therefore, be taken into account when comparing the roots of the same season with one another.

Influence of Inherited Qualities.—Differences of a well marked, and, to a certain degree, constant character undoubtedly exist between the varieties of a class. Thus, for instance, in mangels, for five years in succession, with varying seasonal and soil conditions, the 'Gate Post' has invariably proved itself richer in dry matter and sugar than the Giant Yellow Globe. We must conclude that such differences are due to inherited qualities.

DRY MATTER and Sugar in Gate Post and Giant Yellow Globe Mangels.

—	1900.		1901.		1902.		1903.		1904.		Average of 5 Years, 1900–04.	
	Dry Matter.	Sugar in Juice.	Dry Matter.	Sugar in Juice.	Dry Matter.	Sugar in Juice.	Dry Matter.	Sugar in Juice.	Dry Matter.	Sugar in Matter.	Dry Matter.	Sugar in Juice.
	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
Gate Post	11·14	6·15	9·41	4·15	13·90	9·39	12·93	7·38	12·64	7·62	12·00	6·94
Giant Yellow Globe...	8·19	2·64	9·10	4·08	10·24	5·24	10·89	6·17	9·24	5·26	9·53	4·68

These results show that the 'breed' factor is an important one. They open up a most interesting field for work in the improvement of roots—one which undoubtedly offers an opportunity for obtaining results of practical value to the farmer. The Vilmorins of Paris have already achieved a marked success in this research in the production of the so-called 'Sugar Mangels,' a cross between the sugar beet and the mangel. This root is far superior in feeding qualities to the ordinary mangels, and at the same time gives a very satisfactory tonnage to the acre.

Influence of Season.—The above table, further, may serve to illustrate the effect of the season upon the composition of the root. It would not be altogether correct

to ascribe the differences observable from year to year, entirely to climatic causes, but there can be no doubt that the percentage of sugar (the most valuable nutrient) is particularly influenced by the character of the season. It would seem from our observations that heavy rains and low temperatures in the late summer months had an injurious effect upon the sugar content of the root. From investigation with sugar beets it seems evident that ideal climatic conditions for sugar production include a comparatively low mean summer temperature, certainly not higher than 70° F., an evenly distributed but not excessive rainfall during May, June, July and August, and warm and moderately dry weather during September and October.

ANALYSIS of Roots, C. E. F., Ottawa, 1904.

Variety.	Seeds Purchased from.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of one Root.	
		p.c.	p.c.	p.c.	Lbs.	Ozs.
Mangels—						
Half Long Sugar Rosy	Vilmorin, Paris, France	86·52	13·48	8·70	2	2
Giant Sugar Mangel	Rennie, Toronto	86·08	13·92	9·18	1	15
Half Long Sugar White	Vilmorin, Paris, France	89·20	10·80	5·45	1	14
Giant Sugar White	Graham Bros., Ottawa	88·94	11·06	5·06	4	7
Giant Sugar Rosy	Rennie, Toronto	87·90	12·10	7·00	3	13
Gate Post Yellow	Bruce & Co., Hamilton	87·36	12·64	7·62	2	6
Gate Post Red	" "	88·53	11 47	6·56	2	14
Giant Yellow Globe	Rennie, Toronto	90·76	9·24	5·26	2	13
Mammoth Long Red	" "	87·45	12·55	6·65	2	10
Giant Yellow Intermediate	" "	90·36	9·64	4·75	2	5
Carrots—						
Guérande or Oxheart		89·47	10·53	3·44	1	6
Improved Short White	Steele, Briggs & Co., Toronto	89·59	10·41	3·00	1	6
Half Long Chantenay	Ewing & Co., Montreal	88·94	11·06	3·63	1	2
Turnips—						
Selected Purple Top	Steele, Briggs & Co., Toronto	89·17	10·83	2·73	3	11
Good Luck Swede	" "	89·33	10·67	1·11	3	4
New Century	Graham Bros., Ottawa	88·08	11·92	2·51	3	11
Skirvings	Kenneth McDonald, Ottawa.	88·14	11·86	2·11	3	1
Sugar Beets						
Wanzleben	Berlin Sugar Works	77·88	22·12	15·40	1	4

Mangels.—Ten varieties of mangels were examined. The lowest percentage of dry matter was 9·24; the highest, 13.92; the difference is 4·68 per cent, or practically 33 per cent of the total dry matter. In sugar, the percentages vary from 4·75 to 9·18, or a difference of 4·43 per cent, equivalent to 49 per cent of the total sugar.

The 'Sugar Mangels,' the first six given in the table, as in past years, are characterized (with one exception) by an excellent dry matter and sugar content. These are followed by the variety known as Gate Post, including the Mammoth Long Red which is probably the same mangel under another name. The Giant Yellow Globe and Giant Yellow Intermediate close the list with less dry matter, though showing a very fair proportion of sugar.

Carrots.—The Ox-heart and Improved Short White have given results practically identical as regards dry matter, and very close as regards sugar. The Half Long Chantenay is somewhat richer than these in both respects.

It will be observed that, taken as a class, carrots do not furnish the same amount of dry matter as mangels, and fall considerably below the latter in respect to sugar content.

Turnips and Swedes.—Four varieties were analysed. Of these, the New Century stands highest, both in respect to dry matter and sugar, closely followed by Skirvings.

The Good Luck Swede, though practically equal to the Selected Purple Top in dry matter, possesses a very much lower proportion of sugar. Though comparing very favourably as a class with carrots in dry matter, they are not quite so rich in sugar.

Sugar Beets.—An example of the Klein Wanzleben, grown for feeding purposes, is added in order to show the vast differences in composition that exist between sugar beets and the ordinary field roots

LINSEED OR OIL CAKE.

A sample of oil cake, manufactured by the Canada Linseed Oil Mills, Montreal, and sold as the 'Maple Leaf' brand, has been submitted to analysis. It is stated as being made by the 'old process'—hydraulic method.

The following data were obtained :—

Analysis.

	Per cent.
Moisture	11·29
Protein	32·00
Fat or oil	6·38
Carbo-hydrates	36·81
Fibre	8·25
Ash	5·27
	100·00

Oil cake is widely recognized as a 'concentrate' of great value, both from its high protein content and its large percentage of oil. It is, therefore, unnecessary to say more than that the above figures are in close accord with those obtained in the Farm Laboratories from samples of unadulterated, good quality 'old process' linseed cake.

GLUTEN FEED.

The various by-products of the corn starch factory have been discussed in considerable detail in former publications and their relative feeding values pointed out. At first these products were sold separately, and inspection only was needed to determine, approximately, the nature and value of the material offered for sale. This is scarcely possible now, for all the by-products (with the exception of the germ) are mixed together and sold as Gluten Feed. This should not be confounded with Gluten Meal, which was formerly upon the market and contained about 35 per cent protein and from 8 to 11 per cent fat. It is stated that Gluten Feed is by some being sold as Gluten Meal; this, of course, is distinctly fraudulent. Gluten Meal has, we believe, entirely disappeared from the market, but whether such be the case or not, it is desirable that farmers should know that Gluten Feed is the product now offered them, and that it will contain 10 to 13 per cent less protein and 6 to 8 per cent less fat than the Gluten Meal they were accustomed to use.*

Thus, we may place side by side analysis made of Gluten Meal two years ago and of Gluten Feed received a few weeks ago, both being from the Edwardsburg Starch Co.:

*Since writing the above, and just as this report is going to press, we have received a letter from the Edwardsburg Starch Co. stating that they have a true 'Gluten Meal' upon the market.

	Gluten Meal. Per cent.	Gluten Feed. Per cent.
Moisture	5·25	3·68
Protein	36·38	23·00
Fat or oil	11·05	2·83
Carbo-hydrates	43·83	63·79
Fibre	1·54	5·75
Ash	1·55	·95
	100·00	100·00

The difference between these two in feeding value is at once apparent. The Gluten Meal was sold at $25 to $30 per ton, and the price of the Gluten Feed this year was about $22 per ton. We have no hesitation in saying that the Gluten Meal was much the better value at these prices.

COTTON-SEED MEAL.

This feeding stuff is used largely in the maritime provinces and, as we have pointed out in several of our past reports, great differences in feeding value exist between the brands found upon the market. We have, further, found that the prices are not in accordance with the quality, so that frequently of two meals offered the price of the inferior brand may be only a few dollars, or even a fraction of a dollar per ton less than that of a brand worth, from the feeding standpoint, one-third more. It is for these reasons that we have repeatedly urged that such products be sold under a guarantee stating the amount of protein and fat present. (See page 143, Report of Experimental Farms, 1903.) Until such time that farmers are so protected it has been thought desirable to submit to analysis such samples as might be forwarded. Among these many have proved of excellent quality, with the proportions of protein and oil found in genuine meals. On the other hand, not a few samples have been shown to be of inferior quality. Thus, genuine grades should contain from 42 to 44 per cent protein, and from 9 to 11 per cent oil, and data have been obtained recently from samples received showing a protein content ranging from 19 to 35 per cent, and from 5 to 7·5 per cent of oil.

With respect to the genuine cotton-seed meals, it is evident from our work that the methods now employed extract more of the oil than was the custom, and thus, while reducing the oil-content, tend to increase the percentage of protein.

An analysis is absolutely necessary to determine the percentages of protein and fat (the constituents of greatest importance from the feeding standpoint) a meal may contain, but it will be of assistance to farmers to know that genuine meals are of a bright yellow colour, while inferior grades are much darker and show on closer inspection many fragments of hull intermixed with the finer meal.

UVECO AND FLAKERINE.

These are 'cooked' foods, manufactured by the Uveco Cereals Co., Ltd., Newport, Monmouthshire. Quantities of each were received for trial, the Uveco being intended for cattle, the Flakerine for poultry. In appearance they are not at all dissimilar (though with a little practice they can be distinguished), and give the impression that they consist largely, if not solely, of Indian corn which has been steamed or partially cooked, rolled into flakes and dried. They are bright, clean-looking feeds, with a pleasant, slightly sweetish taste.

Analysis.

	Uveco. Per cent.	Flakerine. Per cent.	*Cornmeal. Per cent.
Moisture	9·75	11·50	15·0
Protein	8·94	12·43	9·2
Fat	3·89	2·37	3·8
Carbo-hydrates	74.62	69·71	68·7
Fibre	1·48	2·22	1·9
Ash	1·32	1·77	1·4
	100·00	100·00	100·00

Aqueous extract:		
Total solids, soluble in cold water	4·76	8·16
Containing dextrine	4·51	6·13

It will be observed that both Uveco and Flakerine contain somewhat less water than corn meal and this, of course, is in their favour. Uveco is considerably the drier of the two.

In protein and fat, the two most valuable nutrients, Uveco (notwithstanding its higher percentage of dry matter) is practically identical with corn meal, and the same may almost be said with regard to the amounts of fibre and ash present. The only difference of moment, therefore, between Uveco and Indian corn meal appears to be that the former contains a larger percentage of carbo-hydrates (starch, &c.), a part of which by the cooking process has been converted into dextrin, which, unlike starch, is soluble in cold water.

Flakerine is considerably richer in protein than Uveco, though poorer in fat. Its percentage of carbo-hydrate is very close to that of Indian corn meal, but a greater proportion has been made soluble by cooking than in the case of Uveco, as evidenced by the larger percentages of extractive matter and dextrin.

While admitting the great palatability of these foods, it is very doubtful if their real feeding value, so far as most classes of stock are concerned, has been enhanced by the cooking process. Many experiments have been made to ascertain the effect of cooking and boiling on foods, and the results show most decidedly that in the majority of instances their digestibilty has not been increased. Very seldom have the practical returns in gains been sufficient to warrant the necessary expense of cooking, and consequently it can only be recommended when it is desirable to render the foods more palatable. Henry in his work on Feeds and Feeding, sums up the discussion on this matter in these words: 'As a general proposition, it may be stated that it does not pay to cook food for stock when such food will be satisfactorily consumed without cooking, for cooking does not increase the digestibility of feeding stuffs, but may lower it, and there is considerable expense involved in the operation.'

It is scarcely necessary to point out that neither Uveco nor Flakerine belong to that class of concentrated by-products which is characterized by a high protein content (Oil Cake, Gluten Meal, Cotton-seed Meal, &c.) and, therefore, cannot be used with economy when the intention is merely to enrich the ration in this constituent.

MEAT MEALS FOR POULTRY.

Among the nitrogenous foods which we now find being used by poultrymen, the various 'meat meals' take a prominent place. Their high protein content makes them

*The analysis of corn meal (average of FF samples), taken from Jenkins & Winton's tables, Washington, D.C., has been added in order to allow a comparison to be made between these feeding stuffs and corn meal.

particularly valuable for supplying to the animal system that nutrient (protein) required alike for egg and flesh production, and which is not found to any large degree in most grains. Moreover, the use of a ration composed exclusively of grain is very apt to lead to an excessive deposition of fatty tissue—and this is undesirable in both laying and fattening stock. The recognition of this has led in recent years to the mixing of a certain amount (usually about one-eighth) of these meat meals with the grain portion of the ration, and this practice has been followed by most gratifying results, especially during winter, and in the summer when the fowls can only be allowed a very small run. Further, the products of the packing house are frequently rich in bone, which, as most poultrymen know, is, when fresh and untainted, one of the best foods for laying hens.*

There are several brands upon the market, varying in price and in quality, and inquiries are being constantly received as to their respective values to the poultry feeder. We have accordingly submitted to analysis such of these as are being used by, or could be procured by Mr. Gilbert, Poultry Manager, Central Experimental Farm. They comprise:—

Beef Scrap No. 1, Cyphers Incubator Co., Buffalo.
Beef Scrap No. 2, Cyphers Incubator Co., Buffalo.
Darling's Beef Scrap " "
Superior Meat Meal, W. A. Freeman Co., Ltd., Hamilton, Ont.
Meat Meal, A. J. Morgan, London, Ont.

Of Beef Scrap No. 1, two samples were examined, obtained a month apart and from different sources.

ANALYSIS OF MEAT MEALS.

Brand.	Moisture.	Protein.	Fat.	Total Ash.	Ash Insoluble in Acid, Sand, &c.
	p.c.	p.c.	p.c.	p.c.	p.c.
Beef Scrap No. 1, Cyphers	7·21	54·50	14·68	19·34	·85
" "	10·52	52·38	15·19	17·29	1·33
" No. 2, Cyphers	5·28	38·75	21·80	31·61	·12
Darling's Beef Scrap	6·67	52·81	13·11	21·91	·99
Superior Meat Meal, Freeman	7·06	45·06	12·45	30·10	·35
Meat Meal, Morgan	5·74	35·19	11·31	40·67	·50

Moisture.—Meat meals by reason of their high nitrogen content are, if at all moist, very susceptible to change of a deleterious character, to become tainted and infested with mites, &c. The drier a meal is the better it will keep. It is advisable for poultrymen to examine critically any meat meal they may be purchasing; it should be sound and dry. Examination with a pocket lens is necessary to detect insect life, which, if present, indicates a certain degree of decay.

With the exception of one of the samples of Beef Scrap No. 1, all are excellent as regards moisture-content. The sample referred to, it is only right to say, was not obtained directly from the manufacturer and may have absorbed moisture through undue exposure.

Protein.—This is the most important of the nutrients, and provided the meal is sound and the sourcme of the protein wholesome and digestible, the value of a meal should be very largely regulated by the percentage present.

* Remarks on the general principles of Poultry feeding and the relative values of different foods and rations, may be found on page 218, 219, Experimental Farms Reports, 1902.

Owing to the difficulties in manufacturing a product of this character that shall not vary in composition, it becomes necessary in considering analyses of the same to overlook small differences. Further, the mechanical condition of these meals makes it an exceedingly hard matter to sample accurately—and irregularities of sampling, of course, become apparent in the subsequent analysis. We may, however, safely divide the meals examined into three classes, according to their protein content.

Class I—50 pr cent to 55 per cent Protein—Beef Scrap No. 1, Cyphers. Darling Beef Scrap.

Class II.—45 per cent to 50 per cent—Superior Meat Meal, Freeman.

Class III.—35 per cent to 40 per cent—Beef Scrap No. 2, Cyphers. Morgan's Meat Meal.

Fat.—This is also a valuable constituent, serving alike as a source of fat in the body and for the production of animal heat, but a large percentage is not desirable in poultry meat meals. In the brands analysed, this nutrient varies from 11 to 22 per cent. In comparing these meals, using the tabulated data, we would impress upon the reader that it is not desirable to have protein replaced by fat ; in other words, a high protein content with a moderate percentage of fat will give better results than a meal containing a minimum of protein and a large percentage of fat.

Ash.—The two last columns of the table allow us to form some opinion of the amount of bone present. The proportion of this material undoubtedly affects the value of the meal when used for laying stock.

We may, for our present purpose, consider bone to consist of, approximately:

Organic matter (nitrogenous and fatty) and moisture, 40 per cent.
Mineral matter (chiefly phosphate of lime), 60 per cent.

On this assumption and, further, supposing that the differences between the data of columns 4 and 5 of the table represent the mineral matter furnished by the bone present, we obtain the following approximate percentages of bones in the various brands :—

Beef Scrap No. 1,	approximately..	30	per cent. bone
Beef Scrap No. 2	"	50	"
Darling's Beef Scrap	"	35	"
Superior Meat Meal	"	50	"
**Morgan's Meat Meal	"	?	"

The very small percentages of 'insoluble ash' make it very plain that in no instance was sand present, either intentionally or by accident.

MILLING PRODUCTS FROM PEASE, OATS AND BARLEY.

Attention has repeatedly been called to the desirability of some official system of inspection and analysis of concentrated feeding stuffs as sold in Canada and which will, further, necessitate the manufacturer or vendor of these products to attach to each bag or consignment a tag bearing a guarantee of the amounts of protein and fat contained by the feed. Such a plan has long been in force with regard to the essential elements of plant food in fertilizers and the ever increasing number of milling by-products now in the market makes it equally important that a similar method be adopted for them. This matter was discussed at some length in our report for 1903,

**This brand effervesces strongly on the addition of acid, showing the presence of a carbonate. It is the only one of the number analysed that so reacted. By reason of this carbonate (probably carbonate of lime) the method here employed for estimating the amount of bone present cannot be applied.

and is only here again brought forward for the reason that recent analyses have furnished an excellent illustration of the force of this contention.

In the early part of the present year a quantity of several such materials was bought from a miller in western Ontario for use in feeding experiments at the Experimental Farm, Ottawa. These on arrival were sampled and analysed and the results are to be found in the subjoined table. Together with the analytical data, the name under which the product was bought, and the price paid are stated:

—	Water.	Protein.	Fat.	Carbo-hydrates.	Fibre.	Ash.
	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
Pea meal, ground pea chips ($25 per ton)	8·02	25·91	2·19	61·19	·20	2·49
Pea dust ($22 per ton)	8·37	26·16	2·77	48·70	10·28	3·72
Ground pea bran ($14 per ton)	8·01	28·53	2·89	48·44	8·11	4·02
Barley feed ($14 per ton)	8·57	12·12	4·34	59·00	10·87	5·10
Meal seeds ($12 per ton)	5·67	7·09	3·83	60·05	19·17	4·19
Oat dust ($5 per ton)	4·81	9·59	3·77	52·13	24·60	5·10

It is quite unnecessary to enter into any detailed discussion of these results in order to make good the point under consideration. A casual review of them with references to the percentages of protein and fat will be sufficient to assure the reader that in most instances the food values and the prices of these feeds are not in accord. Thus, the Ground Pea Bran at $14 per ton contains more protein than the Pea Meal which is quoted at $25 per ton. Again, the 'Meal Seeds' at $12 per ton is poorer in protein than the Oat Dust at $5 per ton. Similar differences are observable between many of the other feeds, and throughout the whole series there is no direct relationship between prices and feeding value. We do not wish it to be inferred that any fraud was intended by this manufacturer; these discrepancies between price and value are, without doubt, the result of ignorance on the part of the manufacturer as to the nature of what he is selling, but they serve, as we have said, to illustrate admirably the desirability of official analysis and the selling of these products with a statement as to their composition attached.

RAISINS.

At the request of the Poultry Division, Department of Agriculture, we submitted to analysis a sample of spoiled raisins, the object being to ascertain if they were of any value as a poultry food. A comparatively large quantity could be purchased at a very low rate (our correspondent writes) and it is interesting to know how they compare with grain (oats or wheat) at the same price—say 1 cent per pound.

Analysis.

	Per cent.
Moisture	7·86
Crude protein	5·19
Fat	3·39
Carbo-hydrates	72·44
Fibre	6·71
Ash	4·41
	100·00

This could not be regarded as of any considerable value either for egg or flesh production as the crude protein is very low—not quite half that present in oats or

wheat, for instance. No doubt a considerable part of the carbo-hydrates is glucose or grape sugar, the function of which in the animal economy is the production of heat and energy, and to some extent, the formation of fat. We do not, however, think that this would prove a satisfactory poultry food even at 1 cent per pound.

GROUND SEEDS.

A sample under the above name was received from Joseph C. King & Co., Port Arthur, Ont. It was in the form of a fine meal, and results, we presume, from the grinding together of the weed seeds, screenings, &c., from cleaning grain.

Analysis.

	Per cent.
Moisture	8·14
Protein	15·12
Fat	8·77
Carbo-hydrates	49·12
Fibre	13·15
Ash	5·28
	100·00

Compared with bran, this product contains about an equal amount of protein and about 3 per cent more fat. It is, however, about 3 per cent higher in fibre.

Provided this feed is found to be palatable, no objection can be urged to its use. The fineness to which it is ground precludes the possibility of any dissemination of weeds over the farm in the resulting manure.

HERBAGEUM.

At the request of several correspondents, an analysis of this well advertised condimental food has been made. It is manufactured by the Beaver Manufacturing Co., Galt, Ont., and its use is stated to 'ensure true economy in the production of milk, flesh, butter, cheese, poultry and eggs.'

Analysis.

	Per cent.
Moisture	6·70
Protein	22·94
Fat	6·98
*Carbo-hydrates	40·61
Fibre	7·86
**Ash	14·91
	100·00

Microscopic examination shows it to consist largely of linseed meal and bran or some other wheat refuse. It also contains, in addition to the salt and sugar stated above, fenugreek and charcoal.

Its price, 4 lbs., 60c., 100 lbs., $12, precludes its consideration as a feeding stuff—and in this connection it may be pointed out that its value as such cannot be equal to oil cake meal. We must, therefore, look upon it largely as a tonic or condiment and suppose that the high price for which it is sold is placed upon it for its (alleged) medicinal properties. But viewed either as a food or medicine, or both, it is altogether

* Including sugar, 2·22 per cent. ** Including salt, 10·17 per cent.

too dear. All its constituents are of a cheap character and the mixture, if desired, could be made at a very much lower figure.

Without denying that such condimental foods may be useful at times, the continuous or general employment of them, as is so frequently practiced, is quite unnecessary and uneconomical. Animals that are in good health and thrifty do no better from the addition of such 'tonics' to their ration—this is the conclusion reached by careful experiment—and it becomes a question whether it would not be far cheaper and better to treat stock that are out of condition as their ailments require.

SUGAR BEETS, FOR FACTORY PURPOSES.

Examples of roots from the three best varieties of sugar beets, Vilmorin's Improved. Klein Wanzleben, and Très Riche (French 'Very Rich'), as grown on the Experimental Farms during the last season, have been analysed.

SUGAR Beets grown on the Dominion Experimental Farms, 1904.

Variety.	Locality.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Co-efficient of Purity.	Average Weight of one Root.	
					Lbs.	Oz.
Vilmorin's Improved......	Nappan, N.S...........	15·59	20·04	77·8	1	4
"	Ottawa, Ont............	16·59	18·50	90·2		14
"	Brandon, Man..........	16·66	20·40	81·7	1	3
"	Indian Head, N.W.T...	14·87	18·00	82·6	1	2
"	Agassiz, B.C.....	7·03	12·13	57·9	1	2
Klein Wanzleben.........	Nappan, N.S..........	13·83	18·03	76·7	1	10
"	Ottawa, Ont............	16·92	19·34	87·5		14
"	Brandon, Man..........	16·65	20·50	81·2	1	6
"	Indian Head, N.W.T...	15·96	19·50	81·8	1	2
French 'Very Rich'......	Nappan, N.S...........	13·82	18·89	73·2	1	5
"	Ottawa, Ont........	17·24	20·01	85·7	1	5
"	Brandon, Man..........	16·56	19·68	84·1	1	8
"	Indian Head, N.W.T...	14·89	18·03	82·6	1	4
"	Agassiz, B.C............	8·17	13·13	62·2	1	2

SUGAR Beets grown on the Experimental Farms, 1904—Particulars of Growth.

Locality.	Date.		Distance Between.			Remarks.
	Sowing.	Pulling.	Rows.		Plants in Rows.	
			Ft.	In.	In.	
Experimental Farm—						
Nappan, N.S.........	May 30..	Oct. 12..	2	0	12	Light clay loam, manured at rate of 25 one-horse cart loads per acre.
Ottawa, Ont........ .						
Brandon, Man........	....	Sept. 24..	3	0	12	Rich black sandy loam, manured three years ago with barn-yard manure at the rate of 10 loads to the acre............ ....
Indian Head, N.W.T..	May 27..	Oct. 6..	2	4	8	Clay loam, 10 loads rotted manure to the acre.
Agassiz, B.C..........	April 25..	" 24..	2	6		

Nova Scotia, Nappan.—The beets of this farm are perceptibly of lower quality than those of last year. This is noticeable in the sugar content, but more particularly so in purity. The average percentage of sugar in the three varieties tested, for 1903, was 15·33, with a co-efficient of purity of 81·3; for the present season, the averages are 14·41 and 75·8, respectively.

It will be observed that as regards both sugar content and purity, Vilmorin's Improved is the best. Klein Wanzleben and Très Riche give results practically identical and are somewhat less valuable for factory purposes.

Ontario, Ottawa.—Both as regards sugar content and purity, the results are considerably in advance of those of 1903, due, undoubtedly, to the more favourable character of the past season. They indicate a beet in all respects eminently suitable for sugar extraction.

The following data will allow a comparison of these varieties for the past three years, as grown on the Experimental Farm, Ottawa.

	Sugar in Juice, per cent.	Co-efficient of Purity.
Vilmorin's Improved—		
1902	17·26	87·0
1903	15·61	92·0
1904	16·59	90·2
Klein Wanzleben—		
1902	17·84	91·5
1903	15·12	86·9
1904	16·94	87·5
Très Riche (French 'Very Rich')—		
1902	15·81	89·1
1903	Not grown.	
1904	17·24	85·7

The results not only indicate the high character of these varieties for factory purposes, but furnish an excellent illustration of the effect of the season upon the sugar content of the beet. In 1903, it will be noticed, there was a considerable falling off in the percentage of sugar, compared with the results of 1902 and 1904. This was due, no doubt, to the exceptional climatic conditions that prevailed that season (1903), a protracted drought in the spring followed by heavy and continuous rains in the autumn. These rains induced a second growth of the root at a time when the storing up of sugar more particularly takes place and for which, if the sugar content is to be satisfactory, warm, dry weather is essential.

Manitoba, Brandon.—For several years past sugar beets from Manitoba, as grown at Brandon and in the neighbourhood of Winnipeg, have been analysed, but we have never before been able to report—save in what might be called one or two exceptional cases—very favourably. Thus in 1903, Vilmorin's Improved gave only 11·36 per cent sugar in juice and 73·7 co-efficient of purity. Reference to the foregoing table, however, shows the beets as grown on the Experimental Farm, Brandon, this year to be of excellent quality. Mr. Bedford, the superintendent, on being informed of the results, writes: 'I was not aware that the season had been particularly favourable to a high sugar content, but nearly all field roots with us have given above an average yield.'

North-west Territories, Indian Head.—In all three varieties a very satisfactory sugar content was obtained. The percentages of sugar are slightly lower than those for 1903, but are sufficiently high for factory purposes.

British Columbia, Agassiz.—The two varieties received this year from the Experimental Farm at Agassiz, Vilmorin's Improved and Très Riche, were very poor in

sugar content, with a corresponding low co-efficient of purity. In 1903, excellent beets were grown here, showing a very satisfactory sugar content. Mr. Sharpe reports 'a very poor season (1904) for mangels, carrots, and sugar beets,' so we must suppose the present unsatisfactory results have been due to specially unfavourable climatic conditions.

CHEMISTRY OF THE SUGAR BEET.

Within the last few years, as is well known, there has been a revival in certain centres in the Dominion of the beet sugar industry, and factories are now in operation at Berlin and Wallaceburg, Ontario, and at Raymond, Alta, N.W.T.

The commercial success of the undertaking at any point depends very largely on obtaining an adequate supply of beets. It is necessary, if the extraction of the sugar is to be profitable and the return to the farmer a lucrative one, not only that the beets be up to a certain standard of richness and purity, but also that the tonnage available, in other words, the acreage be sufficiently large. According to the size of the 'plant' or factory so will the tonnage be necessary for its profitable operation, but we may safely assume that not less than 30,000 tons will be required for a modern factory—one Ontario factory stated 40,000 tons as a minimum, and another, 50,000 tons. If we allow a yield of 10 tons per acre (the average over large areas is somewhat less), the area under beets, within reasonable distance of a factory necessary to satisfactorily supply its requirements, will be from 3,000 to 5,000 acres. These considerations and the further fact that on some part of the farm the crop must be grown annually (or otherwise there will be a shortage of beets for the factory), have led to many inquiries as to the effect of the sugar beet on the soil, i.e., as regards the exhaustion of the more esential elements of plant food.

To answer these inquiries we have submitted to analysis beets—roots, collars or crowns and leaves, separately—at three stage of growth, determining, among other constituents, the percentages of nitrogen, phosphoric acid, potash, and lime present. The variety selected was Klein Wanzleben and the collections were made on July 29, September 8, and October 19. The soil of the plot (Experimental Farm, Ottawa) was a fairly rich, warm, well drained sandy loam.

Immediately on taking the samples the beets were cleaned and the proportions (by weight) of the leaves, collars, and dressed roots (as ready for the factory) determined.

PROPORTION of Leaves, Collars and Roots in Sugar Beets.

Date of Collections.	Leaves.	Collars or Crowns.	Roots.
First collection, July 29	68·3	6·4	25·3
Second " Sept. 8	46·4	12·7	40·9
Third " Oct. 19	37·8	11·4	50·8

The proportion of the dressed root had increased from 25·3 per cent to 50·8 per cent between July 29 and October 19 (practically an increase of 100 per cent), while the relative weight of leaves had decreased from 68 per cent to 37 per cent, or 44·6 per cent. The proportion of crowns or collars, the part from which the leaves spring and which with the leaves is left on the ground when dressing the beets for the factory, increased from 6·4 per cent to 12·7 per cent, practically 100 per cent, between the dates of the first and second collection. On October 19, when the last collection was made the proportion of collar was somewhat less, viz., 11·4 per cent.

The composition of the leaves, collars and roots as regards water, organic matter, and ash, on the several dates of collection, is shown by the following data :—

ANALYSIS of Sugar Beets.

Date of Collections.	Leaves.			Collars or Crowns.			Roots.		
	Water.	Organic Matter.	Ash.	Water.	Organic Matter.	Ash.	Water.	Organic Matter.	Ash.
First collection, July 29	92·16	5·96	1·88	84·21	14·59	1·20	86·38	12·71	·91
Second " Sept. 8	89·16	8·74	2·10	80·95	17·59	1·46	82·12	16·97	·91
Third " Oct. 19	87·58	10·10	2·32	79·50	19·22	1·28	80·70	18·50	·80

Leaves.—These show a general and continuous increase in organic matter and ash constituents throughout the growing period.

Compared, weight for weight, with the collars and dressed roots, the leaves are considerably lower in organic matter, but decidedly higher in ash. This is true at all three periods of growth at which the examination was made.

Collars or Crowns.—These also show a continuous increase in organic matter, though the increase is not so marked as in the leaves. On July 29 the percentage of organic matter was almost three times that of the leaves. On the two last dates of collection it was practically twice that of the leaves.

Compared with the dressed roots, the collars are invariably the higher (from 1 per cent to 2 per cent) in organic matter.

The percentage of ash is intermediate between that of the leaves and that of dressed roots, but unlike that in the leaves does not uniformly increase. The results seem to show a slight increase between July 29 and September 8, but a decline from that date till October 11, practically to the percentage present on July 29.

Roots.—As regards organic matter, we find a marked increase throughout the whole period. The percentage of ash remained the same from July 29 to September 8, and fell off a little from the latter date till October 19.

FERTILIZING CONSTITUENTS IN THE BEET.

Proceeding to a discussion of the essential elements of fertility present in the roots, collars and leaves, respectively, we may first consider briefly the data of the following table, which gives the percentages of phosphoric acid, potash, lime and nitrogen, in the fresh material :—

FERTILIZING Constituents in Sugar Beets (in fresh material).

Dates of Collection.	Leaves.				Collars or Crowns.				Roots.			
	Phosphoric Acid.	Potash.	Lime.	Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Nitrogen.
1st collection, July 29	·051	·563	·129	·231	·106	·382	·038	·194	·086	·403	·068	·148
2nd " Sept. 8	·065	·716	·184	·249	·111	·354	·042	·221	·115	·366	·032	·138
3rd " Oct. 19	·110	·823	·211	·279	·132	·303	·062	·271	·106	·338	·046	·187

Leaves.—As might have been expected from the already observed continued increase in organic matter and ash, the percentages of all these elements increase.

Weight for weight, the leaves are very much richer in potash than either the collars or dressed roots, and the percentage of this element, it will be noticed, makes a very marked advance as the season progresses.

The same tendency is to be observed in the case of the phosphoric acid and lime and nitrogen. It is thus seen that the older leaves, compared weight for weight, contain much more soil-derived plant food than the younger.

Collars or Crowns.—Here we find a slight increase in the percentages of phosphoric acid and lime, but a falling off in the potash.

The percentage of nitrogen shows a notable increase in this part of the beet as the plant grows.

Roots.—As the season advances, the following changes are to be noted: The phosphoric acid slightly increases; the potash shows a slight, but more apparent decrease; the nitrogen apparently increases, though the gain is a small one.

A review of the foregoing data when calculated on the dry matter (water-free material) reveals certain interesting facts:

FERTILIZING Constituents of Sugar Beets : Calculated on Water-free material.

Dates of Collection.	Leaves.				Collars or Crowns.				Roots.			
	Phosphoric Acid.	Potash.	Lime.	Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Nitrogen.
1st collection, July 29	·646	7·18	1·64	2·95	·670	2·42	·24	1·23	·637	2·96	·50	1·09
2nd " Sept. 8	·60	6·61	1·70	2·30	·584	1·86	·22	1·16	·643	2·05	·18	·77
3rd " Oct. 19	·888	6·63	1·70	2·25	·643	1·48	·30	1·32	·549	1·75	·24	·97

Leaves.—Neglecting slight differences, the dry matter of the leaves remains fairly constant throughout the season (July-October) in phosphoric acid and lime.

In potash and nitrogen the percentages decrease perceptibly, more particularly during August. During September there is but little change. It is evident, therefore, that the increase of these constituents before noted as appearing in the fresh leaves, is due to the larger amount of dry matter contained in the leaves as the plant reaches maturity, rather than to any enrichment of that dry matter. This points to the greater absorption of these constituents from the soil in the early stages of growth than subsequently.

Collars or Crowns.—The phosphoric acid and lime do not vary to any large degree, but the percentage of potash falls away very considerably as the plant approaches maturity. The nitrogen suffers slight change, but the direction of the change is not well marked.

Roots.—The most notable fact to be observed is the large decrease in potash content, as the season advances, evidently due in a large measure to relatively less potash being absorbed in the later months of the season and the fact that it is particularly during this latter period that the sugar is developed, thus, as it were, diluting the mineral constituents in the root. The lime is reduced to about one-half, from July to October, very probably the causes being those just stated. There are minor fluctuations of the other constituents, but they are not sufficiently marked to allow of hard and fast deductions being made as to the general trend in content of these elements in the dry matter as the beet ripens.

FERTILIZING CONSTITUENTS PER ACRE.

From the practical standpoint of the beet grower, who naturally wishes to know the amounts of fertilizing constituents taken from the soil and contained in the different parts of the beet at the various stages of growth, the data of the concluding tables will prove of interest and value. The results will also prove useful in a consideration of those fertilizers that it may be necessary to employ for the sugar beet crop, and at the same time maintain the soil's productiveness.

To obtain them we have employed the foregoing data and the weights of the various parts taken from an equal number of beets at date of collection, the only assumption entering into the calculation being that of 10 tons per acre of dressed roots at maturity.

WEIGHT per Acre of the different parts of the Sugar Beet: Computed on the basis of 10 Tons of Dressed Roots, October 19.

Dates of Collection.	Leaves.		Collars.		Roots.	
	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
First collection, July 29	4	1,381	..	879	1	1,475
Second " Sept. 8	9	1,702	2	1,392	8	1,367
Third " Oct. 19	7	872	2	470	10	..

In spite of the large increase in the weight of the dressed roots per acre during the period, September 8 to October 19 (due chiefly to the development of sugar), the total weight of the crop is less on the latter than on the former date. The weights, respectively, are 21 tons, 461 lbs. on September 8, and 19 tons, 134 lbs. on October 19. This is explained chiefly by the drying out of the leaves; the loss of the weight of water in this way being greater than the gain in weight of sugar. It may in a small measure be also due to the breaking off and falling away of certain of the more mature leaves. This would not only lessen the weight of crop at this date, but also reduce the amounts of the fertilizing constituents contained in the crop at this period, and thus explain a certain small decrease in weight of potash per acre noticeable between September 8 and October 19.

It is of interest to observe that of the total weight of crop at harvesting, if the beets are properly 'topped' on the field, practically one-half is removed in the dressed roots.

In the following tabular scheme the data representing the fertilizing constituents in the crop are given, the figures indicating the amounts (per acre) found in the various parts at the three periods of collection :—

FERTILIZING Constituents in Beet Crop. Pounds per Acre (Computed).

Dates of Collections.	Leaves.				Collars or Crowns.				Roots.			
	Phosphoric Acid.	Potash.	Lime.	Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Nitrogen.
1st collection, July 29	4·8	52·8	12·1	21·7	·9	3·3	·3	1·7	3·0	14·0	2·4	5·1
2nd " Sept. 8	12·8	141·0	36·2	49·0	6·0	19·0	2·3	12·0	20·0	63·6	5·6	24·0
3rd " Oct. 19	16·3	122·4	31·4	41·5	5·9	13·5	2·8	12·1	21·2	67·6	9·2	37·4

There is in these results much of interest, but it may suffice for our present purpose to call attention to one or two of the more important deductions that may be made from them. The largest draught is upon the potash. On July 29, the amount was 70 lbs. per acre, increasing to a total of over 200 lbs. by the time the beets were ready to harvest.

The relative amounts of this potash in roots and leaves is also a matter of importance. Thus, according to these results, there is at the time of harvesting the beet practically twice as much potash in the leaves and crowns taken together as in the dressed roots.

Further, we conclude that at this period the phosphoric acid in the dressed roots is essentially equal to that in the leaves and crowns taken together, while the nitrogen in the dressed roots is two-thirds of that contained in the rest of the beet. These deductions will perhaps be more evident from the following table of data, given for October 19, 1904 :

FERTILIZING Constituents in Beet Crop, per Acre.

Constituents.	Leaves and Crowns.	Dressed Roots.	Total.
	Lbs.	Lbs.	Lbs.
Potash	135·9	67·6	203·5
Phosphoric acid	22·2	21·2	43·4
Nitrogen	53·6	37·4	91·0

It is very evident that if the leaves are carted away and used as cattle food the restitution of potash and nitrogen to maintain the fertility of the soil must be very much greater than if the crop is 'topped' on the field.

Another important deduction may be made respecting the period of growth at which this plant food is more particularly absorbed by the beet crop. The figures from which to obtain this information are as follows :

WEIGHTS of Fertilizing Constituents per Acre in Beet Crop (Roots, Crowns and Leaves) at various stages of growth.

Dates of Collections.	Phosphoric Acid.	Potash.	Lime.	Nitrogen.
	Lbs.	Lbs.	Lbs.	Lbs.
First collection, July 29	8·7	70·1	14·8	28·5
Second " Sept. 8	38·8	213·6	44·1	85·0
Third " Oct. 19*	43·4	203·5	43·4	91·0

It needs but a glance to show that there is very little appropriation of soil food after September 1, though from that date till the middle of October there was a large production of sugar, as made evident by the increase in the weight of dressed roots (1 ton 633 lbs. per acre) and the higher percentage of sugar in them. The percentages of sugar in the beet at the various periods, were as follows : July 29, 8·07 per cent; September 8, 14·12 per cent ; and on October 19, 14·94 per cent. This early assimilation of nourishment from the soil, to my mind, points to the desirability of thorough

*From the weight of potash recorded for this collection being less than that for Sept. 8th, it seems quite probable that all the data for the third collection are somewhat too low—owing, we conjecture, chiefly to the loss of mature leaves, as already explained.

preparation of the soil, so that by a favourable tilth or mechanical condition of the soil and a generous supply of available plant food the young plant may make a rapid growth during the spring and early summer months. It is not desirable, as is well known, to grow a large beet, as that would mean a poor beet for factory purposes, but the size should be controlled by the system of sowing rather than by lack of plant food or an unfavourable condition of the soil. The elaboration of sugar—the aim of growing the crop—does not take place to any large extent while the beet is yet young, it occurs rather during the maturation of the plant. For a large production of sugar there must be an abundance of foliage, and this cannot be obtained unless the plant has access to large stores of soil food, both mineral and nitrogenous, during that earlier period in the beet's history, when the foliage is more particularly developed.

THE EFFECT OF RUST ON THE STRAW AND GRAIN OF WHEAT.

The prevalence of rust this season in certain districts of Manitoba has led to inquiries regarding the general effect of this fungus upon the wheat plant—both straw and grain—and more particularly as to how it may influence their feeding value. To obtain data on this subject, samples of both rusted and rust-free wheat have been obtained and analysed.

In order that the results should be strictly comparable, it was important in procuring these samples that the clean and the affected wheat should be of the same age and grown on the same soil. Through the kind offices of the editor of the 'Nor-West Farmer,' we were able to secure such specimens. In the letter accompanying them (under date of September 15), it is stated that both wheats were collected by hand on the same day in the same field, on the farm of Sir William Van Horne at East Selkirk, Manitoba.

There was a marked difference in appearance between them, both in straw and grain. The rust-free wheat had a clear, bright yellow, well-ripened straw; a normal ear, both as to size and colour, and plump, well-filled grain. On the other hand, the rusted wheat straw presented in general a dirty greenish-brown appearance and on closer inspection showed many spots or patches of infection, while its ears were smaller than normal and the kernels light and much shrivelled.

ANALYSIS of Rusted and Rust-free Wheat—Straw and Grain.

—	Weight of 100 kernels.	Moisture.	Crude Protein.	Crude Fat.	Carbo-hydrates.	Fibre.	Ash.
	Grams.						
Straw from rust-free wheat	....	7·92	2·44	1·65	39·00	39·95	9·04
" rusted "	....	7·92	7·69	1·97	38·44	36·78	7·20
Grain from rust-free wheat	3·0504	12·26	10·50	2·56	70·55	2·29	1·84
" rusted "	1·4944	10·66	13·69	2·35	68·03	3·03	2·24

The Straw.—We first notice that in crude protein the rusted straw is much the richer. Under the term crude protein is included all those nitrogenous compounds of a food that go to repair waste, form blood and build up muscle and tissue. The high

value of concentrated feed stuffs is due chiefly to the large proportion of protein they contain. It may safely be concluded, therefore, that the rusted straw, containing as it does more than three times the protein found in the rust-free straw, is very much superior in feding value.

Further, in the rusted straw we have a slightly higher percentage of fat—the constituent next in value to protein—and somewhat less fibre—the element of least value in a fodder, and hence there is additional evidence of the most satisfactory character to support the statement respecting the more nutritious nature of the rust-affected straw.

The Grain.—The small and shrivelled character of the grain from the rusted wheat may be deduced from the data in the first column of the table—the weight of 100 kernels being only half that of 100 kernels from the unaffected wheat. This fact, however, from the standpoint of a feed does not betoken a lessening of the nutritive qualities; indeed, as the data for the protein show, it has, weight for weight, considerably the higher value.

The protein of the shrivelled grain is 3·19 per cent higher than that of the plump grain from the rust-free plant. Part of this higher protein content in the smaller grain is no doubt to be accounted for in its larger proportion of bran—but chiefly is it due to the fact that the transference and accumulation of starch in the kernel has been but partial and incomplete. *

Other features of note in the analysis of the grain from the rusted wheat are: (1) the somewhat larger percentages of fibre and ash—indicating more bran—and, (2) the lower carbo-hydrates (starch) and fat content.

Apart from the valuable information that these data furnish regarding the relative feeding value of the straw and grain of rusted wheat, we have in these results interesting evidence as to the physiological effect of the rust on the wheat plant. Speaking broadly, there are (after germination) two periods in the life of the wheat plant—the first, a period of feeding and assimilation; the second, a later and usually shorter period, during which the food materials accumulated in the stem and leaf (straw) are transferred to and stored in the seed (kernel). There is, of course, no exact time when it can be said that the one ends and the other begins. Under normal conditions there is a gradual cessation of feeding, both by root and leaf, accompanied by an ever increasing movement of the accumulated material to the seed. The first period is characterized by growth, the second is recognized by the maturation or ripening of the seed.

Further, it would seem that in the development of the seed, the albuminoids or protein are the first to be transferred and later—towards the close of the maturation period—the carbo-hydrates (starch, &c.), are more particularly deposited.

The rust apparently does not affect the vitality of the wheat plant during the first stage or period, but as the season progresses and the ripening period advances the fungus attains the ascendancy, crippling the energies and functions of the tissues and checking the movement of the food materials to the seed. In other words, the growth of the rust arrests development and induces premature ripening, which, as we have seen, means a straw in which still remains the elaborated food, and a grain small, shrivelled, immature, rich in protein and deficient in starch.

It may be well to point out that although the rust makes the grain more nitrogenous, it at the same time very materially reduces the yield per acre—the present figures indicating a loss in weight of about 50 per cent.

We have not as yet been able to complete the analysis of the milling products of this shrivelled wheat, but we may rest assured until such time as the data are avail-

* NOTE.—Some years ago in determining the relative feeding value of frosted wheat (which presents a shrivelled appearance very similar to that of the grain from rusted wheat) we found that the protein content was considerably higher than in the unfrozen mature grain. It is evident that the effect of rust and frost in this respect, is the same, resulting in a premature ripening or rather a drying out of the grain which, as we have seen, means a kernel high in protein, but low in starch.

able that its proportion of bran to flour will be higher than from normally ripened wheat. We may, further, conjecture that this bran will be found slightly more nitrogenous than that from rust-free wheat. It is held by certain millers that rust makes the flour somewhat 'stronger,' but at the moment there are no data, I believe, to support this contention.

WELL WATERS FROM FARM HOMESTEADS.

One hundred samples of well water have been received during the past year. Of these, 66 were submitted to analysis, the remaining 34, by reason of insufficient quantity or a dirty bottle or cork, were not examined. In the appended table the data obtained are given, together with a very brief conclusion as to the character of the water. To those forwarding the samples more extensive reports have been sent, indicating the character of the pollution when present, and when necessary and possible making suggestions for the improvement of the supply.

It will be seen by reference to the table that of the 66 waters examined, 27 were returned as safe and wholesome, 18 were found most seriously polluted, and 16 were reported as very suspicious and probably unsafe. Five were saline waters.

There are too many shallow wells in existence and most of them, I regret to say, are situated so that they may receive soakage from the barnyard or similar contaminating source. The barnyard and back-door wells should all be filled up, for they are a menace to the farmer and his family and, further, it should be emphasized that water which is dangerous to use in the house cannot be good for stock.

The soil is an excellent purifying agent, but it has its limitations and once it has become loaded and choked with organic filth it cannot longer perform this beneficial function. When once the soil surrounding a well has become so charged no amount of cleaning the well will prove effective; the well should be abandoned.

Our 'deep seated' waters are for the most part pure and the driven well, placed at safe distance from the farm buildings and equipped with a windmill pump, should be a source on many farms of an ample and wholesome supply for house and barn. There are other sources of good water, creeks, rivers, and lakes, and these can frequently be utilized at little cost. An earnest and intelligent effort will result in most instances in securing pure water, and no farmer should rest content without making this effort if his present supply is from the barnyard well. Pure water is as necessary and desirable in the country as in the city, and there is no reason, with a moderate outlay, why it should not be found in the rural home. We believe there has been a great improvement in this matter during recent years, but the facts clearly show that there is yet room for advance.

All that has been said regarding the supply for the farm applies with equal force to that of the creamery and cheese factory. It was admitted at the Dairy Conference recently held in Ottawa that the water supplies of many of these factories were anything but satisfactory. Instances, and many of them, were given of very foul water being used in the making of both butter and cheese—and the consensus of opinion amongst those present was that there should be a systematic inspection and examination of all the supplies of creameries and cheese factories and, if necessary, to have legislation on the matter. Dairy experts are agreed that neither first-class butter or cheese can be made if the water is not good. It will thus be seen that the water question is one that affects our commerce as well as our health.

ANALYSES OF WELL WATERS, 1904.

RESULTS STATED IN PARTS PER MILLION.

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
			1903.									
1	Dunham, Que.	E. O'L.	Dec. 7	·058	·105	·100	Nil.	65·6	48·0	17.6	Slight trace.	Eminently suited for drinking and household purposes.
2	Calgary, Alta	J. A. T.	" 14	Free.	·162	·44	2·5	667·0	419·0	248·0	None	Good and wholesome.
			1904.									
3	Vankleek Hill, Ont.	J. A. Mac.	Jan. 18	·05	·095	5·171	34·5	422·4	266·8	155·6	Traces.	Very suspicious.
4	Knowlton, Que	S. A. F.	Feb. 6	·445	·425	8·375	5·8	185·6	89·6	96·0	Heavy trace.	Contaminated with drainage matter
5	Welwyn Station, Assa	A. S	" 8	·138	·98	11·559	173·0	8632·8	6140·0	2492·6		Saline water.
6	Fredericton, N.B	F. A. G. No. 1.	Mar. 14	·015	·1875	·267	3·0	72·0	32·0	40·0	Free.	Probably unpolluted.
7	"	" No. 2.	" 14	·09	·045	·111	1·0	8·0	3·0	5·0	"	"
8	Bayswater, Ont.	L. N.	" 19	·036	·135	4·615	21·0	407·6	182·4	225·2	Traces.	Polluted.
9	Oaklake, Man	H. R. T	" 28	·01	·315	4·29	72·5	4071·0	3138·0	933·0	None	Saline water.
10	McAdam, N.B.	J. W. H.	" 28	·06	·05	3·261	9·0	102·4	62·6	39·0	"	Suspicious.
11	"	D. T.	" 28	Free.	·075	3·623	6·75	71·6	33·6	38·0	"	Somewhat suspicious.
12	Nepean, Ont	J. K	" 29	"	·45	5·419	27·5	446·0	247·2	198·8		Very seriously polluted.
13	Dunham, Que.	A. W. W.	Apr. 14	·335	·135	1·815	2·0	182·4	108·4	74·0		Suspicious.
14	Mahone Bay, N.S.	A. C. No. 3.	May 18	·045	·18	·058	4·0	27·6	2·8	24·8	V. S. trace.	Good and wholesome.
15	"	" No. 4.	" 18	·098	·125	·017	4·0	32·4	4·4	28·0	Slight trace.	"
16	"	" No. 5.	" 18	·02	·195	·082	6·25	34·8	6·4	28·4	None	"
17	Clinton, Ont.	D. A. F.	" 25	Free.	·18	11·62	18·3	438·2	254·4	183·8	Traces.	Contaminated.
18	L'Epiphanie, Que.	J. P. C.	June 7	·050	·165	·041	32·5	166·0	126·4	39·6	"	Good and wholesome.
19	Campbell's Bay, Que	T. A McT.	" 14	·10	·90	·29	1·0	253·0	149·0	104·0	"	Very suspicious.
20	Nepean, Ont.	W. L. R.	July 6	13·07	5·03	4·38	110·0	944·8	560·0	384·8	V. H. trace.	Contaminated; unfit for domestic purposes.
21	Hintonburg, Ont.	H. R.	" 12	·024	·115	3·892	14·5	344·0	216·8	127·2	Hvy. ppte.	Seriously polluted.
22	Wallace, N.S.	C. W.-M.	" 20	·036	.4575	·0037	170·0	191·0	112·0	79·0	V. S. trace.	Suspicious.
23	Fredericton, N.B.	E. B. J. No. 1.	Aug. 1	·06	·188	·092	2·3	70·0	33·6	36·4	Traces.	Free from pollution.
24	"	" No. 2.	" 1	·188	·165	·0297	2·8	75·6	35·6	40·0	Trace.	Seriously contaminated.
25	"	" No. 3.	" 1	·03	·14	·0249	2·2	69·2	33·2	36·0	"	Free from pollution.
26	"	" No. 4.	" 1	Free.	·138	·05	1·6	64·4	32·4	32·0	None	"
27	South Durham, Que.	R. M.	" 3	1·14	·135	3·55	22·5	207·6	152·8	54·8	Heavy trace	Very seriously polluted.
28	Muskoka, Ont	W. G. O'H.	" 4	·24	·27	4·923	60·0	344·4	207·5	136·8	Traces.	Contaminated with drainage matter
29	Summerside, P.E.I	J. R.	" 9	·056	·038	3·0	17·0	178·8	103·6	75·2	V. H. trace.	Dangerously contaminated.
30	"	A. C.	" 2	Free.	Free.	·288	9·0	126·4	86·4	40·0	Slight trace.	Wholesome.

31	Elgin, Ont.	G. S. C.	„	9	„	·335	2·095	90·0	575·6	431·6	144·0	Heavy trace	Unfit for drinking purposes.
32	Wallace, N.S.	C. W. M.	„	9	·02	·50	Free.	21·0	146·0	85·2	60·8	Traces.	Suspicious.
33	Sky, Ont.	H. A. McD.	„	9	3·87	·39	9 022	28·0	475·6	403·6	72·0	„	Very seriously polluted.
34	Hampton, N.B	J. D. F.	„	10	Free.	·315	Free.	110·0	602·0	406·0	196·0	Free	Suspicious.
35	Rockliffe, Ont	M. A. S.	„	16	„	·073	·428	2·0	160·4	103·6	56·8	V. S. trace.	Wholesome.
36	Lancaster, Ont.	W. J. S	„	17	·548	·28	Traces.	21·0	343·6	270·8	72·8	Slight trace.	Most seriously polluted.
37	Shawville, Que.	R. H.	„	25	·01	·52	·008	2·25	16·4	3·6	14·8	„	Good and wholesome.
38	Ashcroft, B.C	R. S.	„	25	·01	·078	·304	13·0	1102·4	809·2	293·2	Traces.	Slightly saline, but most probably wholesome.
39	Somenos, B.C.	J. J.	„	30	None.	·03	·214	1·75	45·6	29·6	16·0	Slight trace.	Very good water.
40	Channel, Que	J. W. P.	Sept.	1	„	0·85	3·195	4·25	247·2	192·0	55·2	„	Free from pollution.
41	Arnprior, Ont	G. A. C.	„	6	·21	1·74	6·695	400·	13·20	1032·8	287·2	V. S. trace.	Very seriously polluted.
42	Fredericton, N.B.	E. B. J. No. 5.	„	6	·036	·208	·0197	1·8	74·8	31·6	43·2	„	Good and wholesome.
43	„	„ No. 6.	„	6	·010	·24	·024	2·0	75·2	32·0	43·2	None	„
44	„	„ No. 7.	„	6	·044	·256	·0131	2·5	64·8	34·8	34·0	V. S. trace.	„
45	„	„ No. 8.	„	6	·050	·208	·0082	2·2	75·2	31·2	44·0	„	„
46	Carp, Ont.	J. H. C	„	10	·06	·155	4·48	28·0	417·6	305·2	112·4	Heavy trace	Seriously polluted.
47	Grenfell, N.W.T.	E. F	„	12	·045	·24	None.	23·0	2035·0	1550·0	485·0	„	Saline water.
48	Baldur, Man.	H. McPh.	„	15	Free.	·915	„	14·0	744·5	504·0	240·5	„	Suspicious.
49	Wolseley, Assa	C. J.	„	20	None.	·15	·115	16·5	1671·2	1392·0	278·2	„	Saline water.
50	Monckland Station, Ont.	N. J. R.	„	21	·375	·165	None.	None.	304·0	216·0	88·0	Trace.	Decidedly suspicious.
51	Westboro', Ont.	A. C. M. S.	„	22	·13	·123	„	1·25	152·8	127·2	25·6	V. S. trace.	Suspicious.
52	Sussex, N.B.	W. B. McK	„	30	Free.	·135	·026	5·0	108·0	48·0	60·0	Trace.	Pure and wholesome.
53	„	B. S.	„	30	„	·036	3·805	18·0	142·0	78·0	64·0	Heavy trace	Decidedly suspicious.
54	Arrowhead, B.C	D. T. H.	Oct.	12	·02	·07	None.	Trace.	258·8	230·8	28·0	Trace.	Excellent water.
55	Mayton, Alta	A. A	„	12	1·17	·77	„	....	935·2	624·0	311·2	None	Seriously contaminated.
56	Westboro', Ont.	A. C. M. S	„	22	Free.	·14	2·47	9·8	179·2	117·6	61·6	V. S. trace.	„
57	Yellow Grass, Assa.	G. T. D	„	27	None.	39·02	11·94	2200·0	38928·0	37015·2	1912·8	None.	Strongly saline.
58	Gaspé, Que	M. S. K.	„	27	·31	·625	8·54	11·5	335·2	234·0	101·2	Trace.	Most seriously polluted.
59	St. Samuel, Beauce, Que.	L. P. D.	Nov.	8	·02	·38	·016	Trace.	98·0	43·2	54·8	Slight trace.	Pure and wholesome.
60	Kingsmere, Que.	J. G. G	„	9	None.	·038	2·026	·75	115·2	76·0	39·2	„	„
61	North Gower, Ont.	A. T. J.	„	11	·21	·531	·98	....	259·0	159·0	100·0	None	Very suspicious.
62	Calgary, N.W.T.	A. O. M.	„	18	·01	·108	·47	2·75	438·6	303·6	135·0	V. S. trace.	Free from pollution.
63	Westboro', Ont.	A. C. M. S.	„	18	Free.	·08	1·35	3·8	164·0	114·8	49·2	Slight trace.	Safe and wholesome.
64	Rideauville, Ont	Mrs. J. H. A.	„	19	·05	·12	·38	49·5	870·8	632·8	238·0	Trace.	Very suspicious.
65	Okanagan Landing, B.C.	F. H. C.	„	24	·07	·21	·37	7·0	811·6	435·6	376·0	None	Very suspicious, most probably dangerous.
66	South March, Ont	J. W.	„	25	·038	·113	1·599	26·5	442·8	282·4	160·4	„	Showing evidence of previous contamination and probably unwholesome.

THE SEPTIC TANK FOR THE DISPOSAL OF SEWAGE.

Certainly one of the most hopeful signs of progress, one might almost say of advancement in civilization, at the present time is the widespread desire in the country home for a better and more convenient water supply, for a bath-room, and for those sanitary conveniences (closet, sink, laundry, &c.), which go so far towards making the difference in comfort between the city and the farm house, especially in the winter. The requests for information regarding these matters, and particularly respecting some simple and effective method for the disposal of the sewage from the farm house, have been very numerous during the past year.

As regards the latter question, these inquiries have been answered by an account of the septic tank system, a comparatively speaking new system, but one that has proved highly satisfactory, as far as the writer is aware, wherever it has been tried. In many instances this correspondence has further led to requests for details, dimensions and drawings. It has, therefore, been thought advisable to insert the following detailed account of this system with illustration in the Annual Report, since its publication in this way will not only bring the matter prominently before a very large number of farmers, but will place on record in an available form particulars which it is almost impossible to furnish in the limited scope afforded by an ordinary letter.

We have no hesitation in saying, at the outset, that there is no method of sewage disposal at once so effective, so cheap, and so simple for the farm house, the creamery and the cheese factory, as that which is known as the Septic Tank System. For its working, a water supply in the house or building is necessary, but there is no good reason now-a-days why such should not be obtainable on the majority of farms. There are many means of bringing water from a safe, and perhaps fairly distant source, into the house and barns, and one or other of these, as circumstances dictate, should be employed. Apart from the question of sewage disposal, apart from the convenience and the saving of labour that would follow, such a water supply must now be considered from the health standpoint most desirable, if not a necessity. Reference to results given annually in these reports show that the shallow well, sunk in the barnyard or about the farm buildings ought to be abandoned. Such wells are always a menace to the health of the farmer and his family, and his stock. With a water supply in the house—even though that may consist merely of a tank in one of the upper rooms periodically filled by a force pump, and from which pipes lead to the bath room and kitchen—there is nothing to prevent the installation of this system, which, as one writer of authority puts it, is at once 'inexpensive, absolutely automatic, scientific, simple, and in every way thoroughly efficient and satisfactory.'

Very briefly, the system may be outlined as follows:—The sewage or waste from the closet and sink is conducted by the soil pipe, 4 inches in diameter, into a tank, situated outside the building, in which, without the addition of any chemical or disinfectant, but simply by the action of certain self-sown microbes or bacteria (which accomplish their useful work of destruction largely in the absence of light and air), its organic matter—its filth—is decomposed and rendered harmless, and moreover its disease germs, if any are present, destroyed. The effluent or what might be termed purified sewage is now discharged automatically and intermittently from the tank, either into a filter box containing gravel or sand, or coke, or, better still, into a system of subsurface or distributing field tiles of unglazed ware which allow the effluent to soak into the soil throughout their whole length. The distance from the house to the tank is not a matter of any moment. The tank must be water-tight, and may be constructed of brick or stone cemented or, preferably, of concrete. When this system was first put into use it was supposed that light and air prevented the development of the filth destroying bacteria and, therefore, that it was essential for the tank to be practically light tight and air tight. Further, it was held that the inlet and outlet should be so arranged that the sewage would not be disturbed by currents. According to certain authorities it is still believed that the bacteria can only do their best work under these conditions. More recent investigations, however, go to show that such

precautions are unnecessary. The bacteria which are engaged in this destruction, or rather nitrification, of the organic matter of the sewage do not all belong to that class which can only thrive in the absence of the oxygen of the air. However, these considerations need not be here further discussed. It is sufficient for our present purpose to know that the system, as consisting of the closed tank and distributing tiles, is efficient alike in the satisfactory disposal of house sewage and waste from the cheese factory or creamery.

For practical purposes—that is, for the installation of the system—the following details and the accompanying illustrations will no doubt prove serviceable.

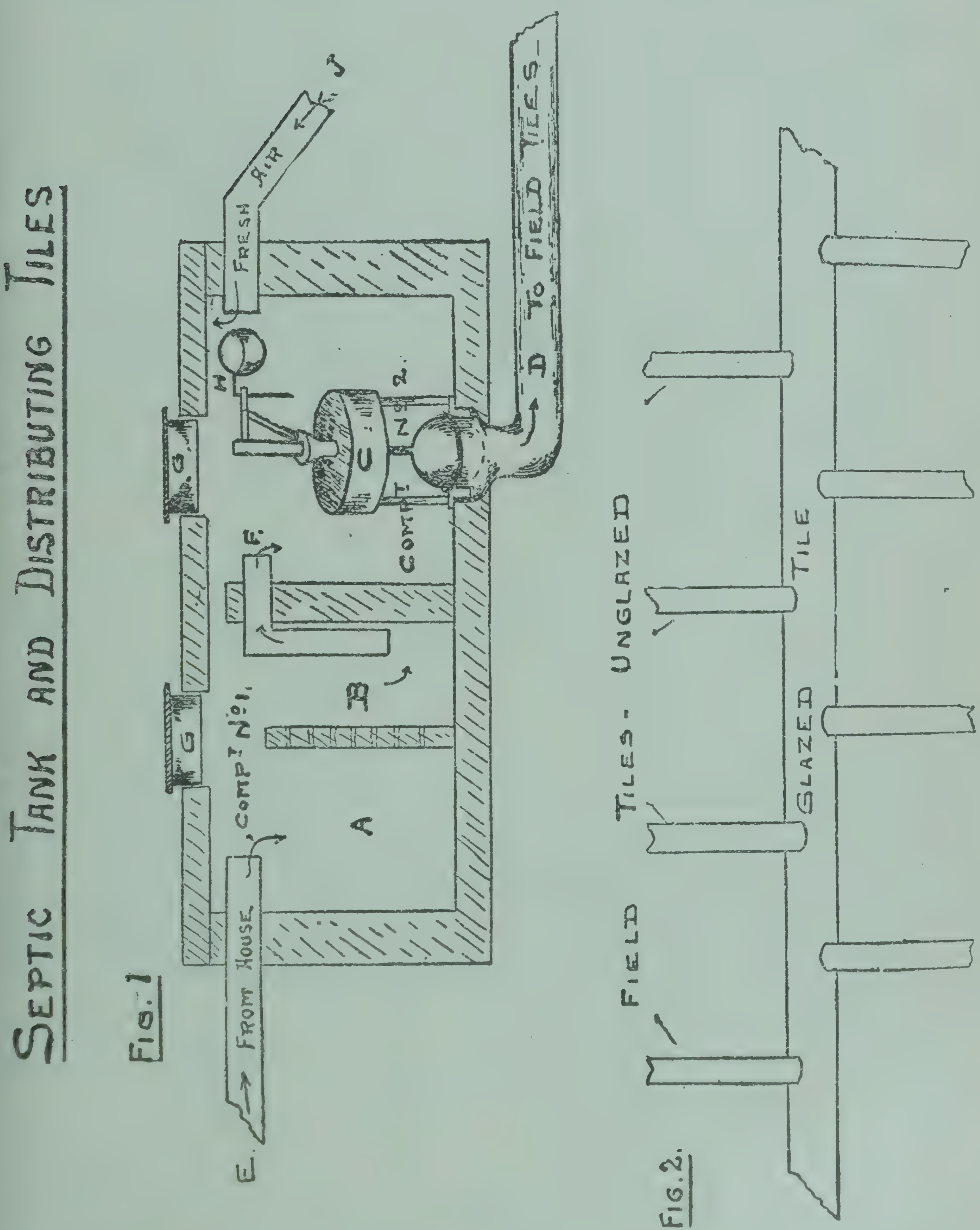

Figure I. represents a tank fitted with the automatic discharge valve. The siz of the tank for the ordinary farm house may be 6 feet long by 3 feet wide by 3 fee deep, or a working capacity, say, of 120 gallons to each compartment. Since it is apparently desirable that the sewage should be submitted to the action of the bacteria fo a period of 24 to 36 hours before passing into the second compartment of the tank it is perhaps better to have the tank a little too large than too small. It is customar to allow a capacity of 12 gallons for each person. It will be seen that by a partitio wall, carried within two inches of the top or roof, the tank is divided into two smalle tanks or compartments, figured as No. 1 and 2. Into the first of these, near the top the sewage from the house flows through the glazed tile E. connected with the soi pipe which opens above the roof. The pipes from closet, bath, sink, &c., should, o course, be trapped before entering the soil pipe.

In this tank or compartment (No. 1) there should be a perforated partition, a shown in cut, to prevent paper and other solids entering the overflow and being carried over into compartment No. 2. It is in No. 1 compartment that the bacteri chiefly effect their work of decomposing the organic matter of the sewage, and whe in time this compartment becomes full its fluid contents pass over into No. 2 by mean of the overflow F. If there is no perforated partition in No. 1 the lower orifice of thi overflow (F) is covered with wire netting which may act as a strainer to prevent an paper, &c., passing into No. 2. In compartment No. 2 is the automatic valve H., connected with the discharge pipe D, which carries off the effluent to the subsurface tile (see figure 2). The success of the system depends largely upon this valve, for it i essential that compartment No. 2 should be emptied as soon as it is full, and the allowed to refill. This can only be satisfactorily accomplished by a self-acting (bot opening and closing) valve.* This second chamber should have a 4-inch vent pipe to allow the entrance of air. Manholes are provided at G, to permit of the examinati of the tank at any time. The probabilities are, however, that no cleaning out wil be necessary for years, as the action of the bacteria is very thorough and complete i destroying the organic matter.

The tank must be so situated that its glazed discharge pipe D. *at the point from which the field tiles are led off is not more than 12 inches below the surface of th ground.* This pipe as well as the field tiles are to be laid on a level so that the latte will be equally filled when the tank is discharged. If the ground be level, this wil necessitate constructing the tank so that a portion of it is above the surface of th land, and in this case it should be banked around, covered with earth and sodded. I is not essential that the tank should be close to the house, but if placed at a distanc the inlet pipe should have a fall from the house and be protected from the frost. Unglazed field tiles inserted every two or three feet along the discharge pipe D. finall distribute the effluent through the soil (Fig. 2). If desired, these distributing tile from D need not commence in the immediate vicinity of the tank, but it is importan that they should not be at a greater depth than 12 inches, unless the soil is very ligh and sandy and has good natural drainage. Since a 4-inch tile holds ½ gallon and it i essential that there should be tile capacity for all the effluent immediately on discharge a tank with a compartment No. 2 of 100 gallons will require at least 200 distributin tiles. If the soil is heavy clay, it should be underdrained. When the soil is of suc a character that percolation is very difficult, the distributing tiles may be replaced b a 'filter box' of sufficient size, filled with sand or gravel, or coke, the effluent enterin near the top at one end and being conducted away from the other end by subdrains However, in practice it is found that a larger tank with less frequent discharge an more tiles is preferable to a filter box.

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*An automatic discharge valve is made by the Dominion Valve Co., Toronto. The pric is from $18 to $25, according to size and quality.

This system is in operation in many parts of Canada and has proved satisfactory wherever installed, so that it cannot be regarded as an experiment. It is in use in rural homes, in several cheese factories and creameries, in asylums, factories, &c., and in every instance, I believe, it is working efficiently.

In the preparation of this article, the writer has consulted Dr. P. H. Bryce, Chief Medical Officer of the Department of the Interior, who, when Secretary of the Provincial Board of Health for Ontario, was instrumental in introducing this system into various public institutions. He authorizes the statement that after 15 years' experience this system properly installed has proved the most sanitary and most economical method yet discovered for sewage disposal on a moderate scale.

AN AGRICULTURAL TOUR IN BRITISH COLUMBIA.

Accompanied by Mr. J. R. Anderson, Deputy Minister of Agriculture, Victoria, I visited during May and June of the present year the greater number of the more important agricultural districts of that province, both on Vancouver Island and the main-land. This tour had been under contemplation for some time past, for the number of inquiries regarding soils, crops, &c., &c., received from that province has been steadily on the increase for several years, and it was felt that the information, the advice thus sought could be more satisfactorily given if the writer had some personal knowledge of the country, its soils, and methods of farming. Further, it was desirable to study more fully the climatic conditions prevailing in the various districts referred to, as well as to obtain an insight into the practice of irrigation, largely used in the Okanagan, Nicola and valleys and other parts of the 'dry belt' of British Columbia. The itinerary was planned and arranged by Mr. Anderson, to whom I am greatly indebted for much help and many kindnesses. It was at a time when one could best study the soils and their crops and afford an opportunity of meeting the men working the land on the land and discussing with them their failures and successes. The days, therefore, were spent largely in examining soils, crops, and conditions generally. We were frequently accompanied through the fields by the farmer and his neighbours and this enabled us to hold many impromptu meetings 'on the ground,' which proved of much interest and value to all present. In the evenings, meetings of a more general character were convened under the auspices of the local Farmers' Institute. In all, twenty-one of these evening meetings were held and addressed, and with very few exceptions the attendances were large. The interest of the people in agricultural matters was evident at every point visited and there was a sincere desire on the part of all whom we met in this way to benefit as far as possible by our visit. Considered from every point of view, I look back upon this tour as possibly the most satisfactory I have ever made to any province in the Dominion. The information gained must be of immense value to me in the future when considering the farming problems of that province, and in this connection, I desire to add that very much of the interest and enjoyment of the trip was due to the intimate knowledge of the country by Mr. Anderson, who was not only of the greatest service to me, but who strove to make my visit both pleasurable and profitable, and in this was eminently successful.

It will not be possible to give any detailed account of this survey trip here, but an outline enumerating the places visited, together with one or two of the more salient features of the districts examined, may prove of interest.*

Vancouver Island—Nanaimo and Cedar.—Though there are clay lands in this district their area appears to be limited. The larger part of the soil is of a light sandy or gravelly nature, which is frequently deficient in humus. The value of clover—

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*A report of this tour, in extenso, has been written by Mr. Anderson, and will appear in his forthcoming report of the Department of Agriculture for British Columbia.

which undoubtedly will grow well here—for replenishing the soil in this valuable constituent was pointed out. The clay soils require similar treatment and would also be improved by an occasional liming. The use of swamp muck as a fertilizer was explained and the most economic treatment for bringing these muck soils (which occupy considerable areas in Vancouver Island) into successful cultivation, given. Orchards here were found, as a rule, in sod. This is evidently a plan not best suited for the soil and climatic conditions prevailing. Dairying is progressing and a creamery, started about a year ago, is stated as making good progress and leading to the increase in the number of milch cows, and consequently to more manure produced on the farm. There seems no reason why pork production should not increase with the development of the dairy industry and thus give the farmer an additional and lucrative source of revenue..

Comox and Courtenay.—This has already established an excellent reputation as a dairying district, there being good pasture, excellent water and some very fine dairy animals on practically all the farms visited. The co-operative creamery at Comox is well patronized and is stated to be in a flourishing condition. Greater care is required to keep the fields free of weeds, among which we noticed the Canada thistle and Velvet Grass. This latter is almost worthless as a pasture grass or for hay, and efforts should be made by ploughing up old pasture and re-seeding neglected fields to stamp it out. A very noxious weed that is spreading here and elsewhere on the island is the Wild Barley *(Hordeum jubatum).* Its awns are dagerous, causing sores in the jaws of the cattle eating the grass. Since dairying will undoubtedly be the most important branch of farming here, the value of corn and the silo was pointed out. In both Nanaimo and Comox districts the introduction of silos would no doubt be advantageous.

From Courtenay we proceeded to Cumberland, and from that point drove to Parkville—most of the way being through a magnificent forest, chiefly of Douglas fir, cedar and balsam. There are but few ranches as yet along the road. The soil on the higher ridges is light and gravelly, but much of the nature of a black sandy loam is noticed in the lower levels. At Parkville there was an excellent meeting, at which many matters of interest in connection with the treatment of soils, &c., were discussed.

Alberni.—The drive from Parkville to Alberni (27 miles) traverses a most magnificent primeval forest, one certainly that no effort should be spared to protect from the ruthless axe of the lumberman. This region would, if reserved, make a national park of unexcelled beauty and grandeur, for its scenery, especially in the vicinity of Cameron lake, is very fine. Managed under the rules of good forestry, moreover, it could be made remunerative, which we scarcely think will be the case once the trees are gone, for the soil is very light and for the most part ill adapted to agriculture.

At Alberni a beginning is being made in co-operative dairying, a creamery being in course of construction a few miles from the village. This will materially help to improve the farming prospects, by converting the raw material into a finished and more concentrated product. There will then be a possibility of getting the produce to Victoria and other markets, at present impossible owing to well nigh prohibitive freight rates. The reclamation of muck lands was a subject here of much interest as there are large areas now in swamp that might be made productive.

On the Mainland—Agassiz and Chilliwack.—These were the first places visited. Two days were spent with much profit on the Experimental Farm at Agassiz, and under the experienced guidance of Mr. Sharpe, the Superintendent, much information was gained as to the possibilities of the district, not only as a fruit-growing area, but also as to its suitability for mixed farming. It was somewhat a matter of surprise to me to find such excellent soil on the upper benches of the mountain here, soil of better quality in fact than much of that occupying the flats level with the river, the greater part of which at this point is of a very sandy or gravelly nature. The luxuriance of the clover crop here showed that there should be little difficulty in economically maintaining the soil's fertility.

Chilliwack is essentially a dairying district, and here two days were spent in inspecting many of the good farms in the neighbourhood. There are two creameries in operation and each, I was told, had its full quota of patrons. Oats are extensively grown, but the chief crops are roots and clover, though the area in Indian corn is yearly increasing. This is essentially one of the most thriving and prosperous of the districts visited. The crop yields are reported as excellent. Velvet Grass, already referred to is, however, taking possession of some of the fields owing to poor methods of farming. In certain portions of this district the soils were found to be sour and in a measure unproductive, owing to insufficient drainage. I, therefore, spent considerable time in discussing with the farmers such means as might be practicable for lowering the water level, which I feel sure is essential to making such soils profitable. There are certain areas here covered with muck soils, and we, therefore, devoted some time to their careful inspection and the outlining of such treatment as we considered desirable for their improvement.

Ladner and the Delta Districts.—Between two and three days were spent in visiting the farms of the Delta, which for the most part are devoted to dairying and are in a thrifty and prosperous condition. Clover, grasses, roots and oats, all give large yields on this excellent soil, which, at many places on the lower Fraser, has been formed by the deposition of rich silt brought down by the river.

Though good pastures were seen that had not been re-seeded for 10, 15 and, in one case we saw, 30 years, my opinion is that still better results could be obtained if they were broken up from time to time and resown. One reason for this opinion is that the Velvet Grass and Buttercup *(Ranunculus acris)* have in many fields taken such possession as to crowd out to a very large extent the clover and good grasses.

A general neglect of the orchards is noticeable in this district ,the trees showing want of pruning and care, the soil being uncultivated and the Tent Caterpillar very common. This pest had in many places stripped the trees of their foliage.

A large number of fine milch cattle in excellent condition were seen here, as at Chilliwack.

Most of the land is of a heavy, plastic nature and would, we believe, be improved by more thorough drainage and an occasional liming.

The district is on the whole in a thriving condition, the only serious drawback being the scarcity of really good water. Nearly all that is used is taken from the ditches between the dykes. The difficulty in this water problem lies in the fact that much of the land is below the level of the river. A system of supply that would convey water from the higher lands and distribute it over the Delta would prove a great blessing.

THE DRY BELT.

Spence's Bridge and Nicola.—Up to this time I had never visited the Dry Belt, and beyond what I had read and had been told, my impression had been formed from what could be observed from the carriage window in passing through on the line of the Canadian Pacific Railway. These impressions, from the agricultural point of view, I am willing to confess, had not been very favourable. The general aspect is forbidding, the apparently barren soil bearing a scanty growth of sage brush and it is indeed difficult to realize that the country is one adapted to agriculture. A closer acquaintance, however, with those parts cultivated under irrigation was destined to dispel this impression and to make one astounded at the truly marvellous results obtained on this sterile looking soil merely by the aid of water. Crossing on the ferry at Spence's Bridge, I had the opportunity of personally examining for the first time the results of irrigation, and these results were certainly a revelation. The farms of Mr. Clements and Mr. Smith are veritable oases. The crop of clover and timothy

which was being cut, was very fine; growth generally was of the most luxuriant character and the fruit trees vigorous, healthy, and bearing well. A casual inspection of the soil, apart from what it can produce with the aid of water, certainly would not lead one to suppose it to be a fruitful one; indeed, it would on such an examination be generally judged as of poor quality. We purpose, therefore, during the coming year to subject typical samples of these soils to careful analysis and hope therefrom to arrive at some better knowledge than we have to-day regarding the cause of their great productiveness. Very possibly it may be shown that the climatic conditions prevailing have been conducive to an accumulation of 'available' plant food—we think this more than probable—and if this proves true it will point to the desirability of carefully husbanding this most valuable heritage and not allowing its waste by the excessive use of irrigation water.

From Spence's Bridge to Lower Nicola the road winds along on the side of the Nicola canyon. Several farms on the route are to be observed, chiefly at the bends of the river, most of them apparently being occupied by Indians, near the cultivated spots. The irrigation ditches are to be seen winding their way down, or rather around, steep inclines of barren-looking soil, carrying a stream of living water brought from some creek at a higher level; then as they reach the bottom lands branching and losing themselves and their precious burden in innumerable smaller channels amongst the most luxuriant herbage of field and orchard. Agriculturally speaking, one cannot help realizing, with water, everything; without water, nothing.

At the Lower Nicola we stayed two days in order to allow me to more thoroughly study the irrigation schemes in vogue, to examine the crops and to visit certain outcrops of 'alkali' that I had been asked to report on. It would be undesirable here to enter fully into the several problems in connection with irrigation that must be solved if this country is to be more than sparsely settled, but we may briefly refer to one or two of the more important features, as they occurred to the writer. We have first to recognize that in many parts the water available for irrigation purposes is limited —many ditches several miles in length were seen, proving that even now water has frequently to be brought long distances. To obtain an equitable distribution of the water is of the utmost importance to the future welfare and progress of this country, for land and farms without water are practically unproductive and valueless. If the tapping of the streams and other sources is left so largely to the greed or caprice of the individual, if the conservation or storage of available waters is neglected, it seems scarcely likely that the community can continue to benefit equitably from the supply. At present much water is wasted that might on other lands prove of the greatest service.

Secondly, we should like to point out how the more frequent use of the cultivator and harrow to preserve a dry earth mulch, might be profitably substituted for water. Such a method of conserving soil moisture is most effective and quite applicable in orchards and for root crops.

Lastly, it is quite evident that in some places too much water is used. The excessive application is detrimental both to soils and crops—the soils are injured physically and chemically, by being choked, becoming sour and losing their more soluble plant food, and the crops suffer through the drowning of their roots. In several instances, we noticed much harm as resulting from this excessive use, especially on the lower levels.

Patches of land were examined that were evidently suffering from the presence of alkali, of which both the 'white' and the 'black' forms are found here. The nature and origin of alkali were explained and the best methods for the treatment of such lands outlined. We took pains at all our meetings and demonstrations in the dry belt to give information on this matter, as well as to speak on the equally important matter, the use and abuse of water in irrigation.

At Loewr Nicola and at Coutlées truly magnificent crops of Red Clover, Alfalfa, Sainfoin, and Alsike Clover were seen—it was very evident that all the legumes thrive

here. On the roots of all those examined, nodules were found. Potatoes and root crops also do very well. The chief agricultural industry is at present the production of beef though we think, with railroad facilities to a market, the district would prove almost equally suited to dairying and orcharding. The universal custom is to allow the cattle to find their own food in the woods on the mountains during the summer and to feed them in the winter months on the hay cut from the irrigated fields already spoken of. As the land is taken up, this primitive method of farming must be more and more abandoned, and we are of the opinion that even in beef production the more modern methods which the changed conditions will render necessary to adopt, will be more remunerative than those now in vogue.

A day was spent in the vicinity of Nicola, where there was further and abundant evidence of the wonderful growth of both grasses and clovers.

On the road between Nicola and Kamloops many excellent farms were visited, though some fields, we regretted to notice, were badly infested with wild mustard. Exceptionally fine crops of Alfalfa and Brome Grass were examined at 'Pattersons,' about half way to Kamloops. Two, and frequently three, cuttings, I was told, were taken from the former in the season, while the latter gives a large yield of hay and a very heavy and palatable aftermath for grazing.

Strange as it may seem, great injury to roads and fields had been caused in several places along the route by freshets in the spring. With uncontrollable fury the waters had burst forth from the ravines bringing huge boulders, stones, trees, &c., with them and ruining thereby sometimes beyond hope of reclamation, considerable areas of fine land.

Unfortunately our programme did not allow time for an excursion to Grand Prairie, where I am told there is an excellent farming section and a large number of interested and intelligent men.

From Kamloops a drive was taken on the north side of the Thompson river, along which a ditch to bring water for irrigating purposes is being constructed. The water will be conveyed about 17 miles from Jameson creek. It is expected when the scheme is finished that several thousand acres can be brought into productive cultivation.

The Okanagan.—Proceeding from Sicamous to Okanagan Landing by rail we thence continued by boat to Summerland, a comparatively speaking new agricultural development near the southern end of the Okanagan Lake. This and Peachland, further north on the same side of the lake, were of particular interest to me, by reason of the methods by which they have been developed and exploited by the parties or companies originally owning these sites. The land after careful survey, has been divided into five and ten acre lots, allowances for roads, &c., being made. These lots are sold subject to certain rules and taxes, among the latter being an annual rate (25 cents per acre at Summerland) for irrigation water supplied by the company. The newer of the two places is Summerland, and here at present the greater activity is evident. Many of the lots have been planted as orchards, and if not at present worked by the owner are managed by the company, which, in addition to an initial charge for breaking and planting, collect an annual fee for this care of the trees. The land before this operation has a 'thin' look and is sparsely covered with the native sage, &c., but with working and the careful application of water, it can no doubt be made productive. We should strongly advise, however, better preparation of the soil, than has been the practice, before setting out the trees, and we further believe that the fertility of the soil should be kept up by the occasional growth of clover or some other legume. There is no doubt as to the success of clover here—evidences were clear as to that—and it is the height of folly to imagine, as many do now, that nothing further than water is or ever will be necessary. The climatic conditions we recognize as most favourable, but warmth and water, though all important, do not constitute all the factors necessary for profitable fruit growing. Most of the people who have taken lots speak enthusiastically of the future and certainly the prospects are promising. Summerland is yet in its

infancy and necessarily some years must elapse before there can be much return. Peachland is older and should be in a position to ship fruit in considerable quantities in a year or two. Many who are taking up land in this district have had no experience in fruit growing, but a hopeful sign is the general desire for information by the new-comers. There seems no doubt of the suitability of the climate for fruit, nor with regard to obtaining good markets for the produce in the Kootenays, the North-west Territories, and Manitoba. We may, therefore predict that with careful management of soil and water and the experience that will be gained in the actual culture of the fruit, there is a large measure of success in store for these and similar localities. In addition to apples, pears, cherries, and peaches, corn, melons, tomatoes, and small fruits and vegetables generally are, it is stated, raised successfully.

A very fine cherry orchard in full bearing was seen at Trout Creek, a few miles below Summerlanod. Large shipments of delicious fruit were being made at the time of our visit.

At Peachland the orchards on most of the lots are thrifty. Many of the peach trees were coming into bearing and gave great promise. Examination of the soil revealed areas of excellent quality, more particularly on some of the higher levels. Careful management of the irrigation water is here necessary as it was noticed that the seepage from water applied on the upper slopes appeared on some of the lots at the base of the hill. In several places this was excessive and doing injury to the trees. These lots required drainage rather than irrigation.

Kelowna.—Several very fine cherry orchards were seen in this vicinity, notably those of Mr. Pridham and Mr. Stirling, and that the district, speaking generally, is eminently adapted for fruit there can be no doubt. Certain large estates in the neighbourhood are being subdivided and sold in small lots for fruit culture and the 'boom' in land was apparently as active here as elsewhere in the Okanagan district.

Through the kindness of Mr. Chaplin, Secretary of the Farmers' Institute here, I was enabled to go over a large amount of the ground within a radius of 25 miles of Kelowna. At one or two places patches of alkali occur and samples were taken for further examination. One very interesting drive was through the main valley to Duck Lake, returning by 'Dry Valley.' This main valley, or rather the greater part of it, has for the past twenty-five years been cropped with wheat without any rational attempt to maintain the soil in a productive condition. The result is most deplorable. Land that I am told was once the most fertile, has been reduced to such a condition that in many instances I could see the crop was not worth harvesting. The heavy clay of which most of this land is composed has been depleted of its humus and available plant food to such an extent by continuous growth of wheat that it is now refractory, hard and altogether unsuitable, chemically and physically, for farming purposes. The only hope for this land which has been so ruthlessly treated lies in the addition of humus and nitrogen through the growth of clover or some other of the legumes. This no doubt will be very difficult to obtain at the outset owing to the condition of the land, and probably at first buckwheat or rye will be found easier to grow for green manuring. These, however, should be followed by a leguminous crop to enrich the soil in nitrogen. We also think that tile drainage and occasional liming will be found valuable in reclaiming the land, both tending to improve its physical condition. Towards Duck Lake several large hay farms were seen, the crops on the whole being good. 'Dry Valley' suffers for want of sufficient irrigation water. If by an engineering scheme water could be brought at a reasonable cost into this valley, there is a large area of arable land here that would be made profitable.

Vernon.—This is widely and favourably known as a fruit-growing district. There is very little grain sown now, but the area devoted to fruits of all kinds is continually on the increase. The planting out of orchards is considered a profitable investment. The interest and pleasure of our visit to Vernon were much enhanced by our stay at

Coldstream ranch, the estate of Lord Aberdeen, Mr. Ricardo, the manager, having kindly extended to us his hospitality. Mr. Ricardo not only took us over the larger portion of this magnificent and well-kept estate, but drove us over a considerable part of the surrounding country. In this way I was able to learn much of the character of the soil, the methods of irrigation in vogue, and the capabilities of this highly favoured district.

A visit to the Commonage was of much interest. This district lies only a few miles from Vernon, but unfortunately has practically no water supply available for irrigation purposes. For the past few years, I understand, the farmers here have done fairly well (the district has been settled about six years) owing largely to a succession of wet seasons. This year being exceptionally dry, the crops are very short. It is certainly a hazardous undertaking when farming is attempted here without the aid of irrigation. Excellent meetings were held under the auspices of the Farmers' Institute at Vernon and Commonage.

Armstrong.—It is held that here and northward there is a sufficient rainfall for agricultural purposes and therefore irrigation is not practised. However, the present season had been a very dry one and as a result very short grain crops were obtained. Much of the soil is very heavy and had become refractory owing to poor methods of farming. It stood badly in need of humus. Where hay was grown, both the crop and the soil were better. The soil generally is a strong one, but it already stands in need of much better treatment—which may be outlined as comprising, the growth of clover, more attention to rotation of crops, the use of tile drainage, and the application of lime. We, further, are of the opinion that both dairying and fruit growing might be considerably developed with advantage to the district.

From Armstrong the drive to Enderby was taken, spending a day or two on the road at Sir Arthur Stepney's ranch, now in charge of Mr. Heggie. It is only right that I should add, this ranch is being conducted on rational lines, the land constantly improving rather than deteriorating. As already remarked, much of the land in this district of Spallumcheen is unprofitable, due to the continuous growth of wheat.

At Enderby the general conditions of soil, &c., are much the same as at Armstrong. It has been a wheat-growing district and in consequence the land has suffered. Where Alfalfa and clovers are grown, excellent crops are obtained and the land is steadily improving. If the farmers can only get away from this practice of wheat after wheat and grow the legumes more largely, this district will assuredly hold its reputation as amongst the richest farming areas in the province.

From Enderby we went to Mara on the Spallumcheen river, where a number of low lying, mucky lands were inspected and instruction given for their reclamation.

The last locality visited in British Columbia was Salmon Arm, on Shuswap Lake. Some very promising orchards were seen here, and the district is considered as one eminently adapted to the apple. Though a certain amount of dairying and mixed farming is carried on, it is evident that the future growth of the district is intimately connected with its development as a fruit-growing centre. We were enabled to see many comparatively large areas that had been recently planted, and all gave promise of good returns.

In conclusion, I should like to thank all those who helped to make this tour of such great interest and pleasure to me; many devoting time to driving me over the country in the various districts, explaining much which otherwise would have been obscure, and many kindly and hospitably entertaining me. I should also like to say, as a last word, how gratifying it was to meet so many who were anxious to benefit by our visit. Never have I had the pleasure of speaking to more interested and enthusiastic men than those I met on the field and at the meetings of this visit to British Columbia.

REPORT

OF THE

ENTOMOLOGIST AND BOTANIST

(James Fletcher, LL.D., F.L.S., F.R.S.C.)

1904.

Ottawa, December 1, 1904.

Dr. William Saunders,
Director of Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to hand you herewith a report of some of the most important subjects which have been brought officially under my notice during the past season.

The development of the Division of Entomology and Botany in the various directions has been pushed forward as evenly as possible, with an effort not to allow any work once undertaken to fall behind by giving undue attention to other branches.

Collections.—During the past year, as previously, the collections of insects and plants have been very much increased. Large additions have been made from material collected in the field, as well as also through the kindness of correspondents who have applied to the Division for help in their studies of insects and plants. The great attention which has lately been directed to Nature Study in schools has brought the officers into close contact with many teachers and students in the public schools of the country. There are few things more marked, in matters connected with the development of the country, than the keen interest which is being shown by all classes of society in those investigations which in a general way may be grouped under the head of natural history, and with which the work of the Division of Entomology and Botany is intimately associated. This includes not only a study of insects of all kinds, and plants, wild and cultivated, but also allied researches in forestry, the reclamation of land from the encroachments of the sea or of drifting sand, and also to a certain measure investigations into the habits of birds and animals with which farmers come into contact in their every-day life. This new movement in the schools of the country is giving to the growing boys and girls, who in a few years will be the citizens of Canada, an elementary knowledge of many of the common things which surround them every day of their lives, and which for this very reason are of importance to them. A practical knowledge of animals, plants and natural phenomena cannot but be of enormous assistance to the farmers of the country, whose every occupation is connected in some way with nature. The Nature Study movement is going steadily forward, and it has been a great pleasure to the officers of the Division to be in a position to encourage and help those who have taken it up so earnestly in all the provinces of the Dominion. Our collections here have been of much use in this work, and many visitors have availed themselves of the opportunity of consulting the cabinets.

Insects.—As in previous years, much time has been given to the rearing of insects, eggs or larvæ of many of which have been received by mail from all quarters or collected in the field. An exact knowledge of the preparatory stages of insects, the number of broods, and the time at which they develop, is of the greatest value when devising remedies for injurious species. Careful notes are taken of every species studied, and year by year the collections are enriched by the addition of specimens reared from the egg and prepared for the cabinets, showing all stages of growth, as well as the work of the various species. At the same time, records are kept for reference or for future use in the reports when sufficient data have accumulated or when occasion demands it.

Plants.—Extensive additions have been made to the herbarium, either from specimens sent in by correspondents for naming or as donations; and in many instances fine specimens of rare plants have been acquired by growing the plant from the seed and securing samples at different stages of development. During the year the herbarium has been gone over, and many imperfect specimens have been replaced by better ones, or additions have been made by increasing the series of various species by representatives from other localities.

The collection of weed seeds has been largely increased, and it is now a rare thing for a seed to be submitted by seedsmen or purchasers of seeds, or even to be sent in by students, which cannot be recognized. The institution of the Seed Division, under the Commissioner of Agriculture and Dairying, has had a most marked effect upon the quality of all kinds of seed now offered by seedsmen, and it may be justly said that at the present time, if purchasers will pay a reasonable price, they can easily obtain in Canada all crop seeds of the highest quality, both as to vitality and as to freedom from the seeds of other plants.

Fodder Plants.—The Experimental Grass Plots during the past season have been very attractive to visitors. The season at Ottawa was extremely favourable for the development of all fodder plants, and consequently very complete collections of all the leading hay and fodder plants were made for exhibition at the various fall fairs and other exhibitions where the government has assisted by sending exhibits. A large collection has also been made for the museum at the Central Experimental Farm.

Reclaiming Sand Hills.—A visit was paid to the large tract of shifting sand near Lachute, Que., locally known as the Argenteuil Sand Hill. This is estimated as now covering nearly one thousand acres, stretching along the Ottawa River in an elongated patch about four miles long by half a mile to one mile in width, for the most part entirely destitute of vegetation, but bearing in places clumps of spruce trees, birches, maples, tamaracks and willows. As is usually the case on such areas, the surface is very dry; but a few inches below this there is an abundance of moisture available for the support of any plants which can be protected against the drifting sand. At the request of Mr. Thomas Christie, M.P., I called upon the various farmers living around this sand hill and examined the work they had been doing in their efforts to control the sand. I found, without exception, that every one of them had taken a keen interest in fighting against the common enemy, and much good work had been done in the way of holding back the drift by planting trees and other vegetation. Since 1898 the attention of the Division has been directed to this tract of land, and a few hundreds of plants of the Beach Grass, and also of Norway and White Spruce trees, have been sent to different farmers to be planted on the sand as an experiment; but no extensive work has been carried on by the department. I was much pleased to see the success which had attended the efforts to grow trees on this apparently barren sand hill. The kinds of trees which were noticed growing wild in the scattered clumps which here and there appear, were White Pine, Tamarack, Canada Balsam, White Spruce, White Cedar, Balm of Gilead, Aspen Poplar and White Birch; and round the edges all the ordinary forest trees of the region are represented. In low spots two or three kinds of willows and the Gray Alder flourish. Of shrubs which attracted attention by their vigour and

the extent to which they had spread out in every direction, special mention may be made of the following kinds which doubtless can be made use of in prosecuting this work. The Willow-leaved Meadowsweet (*Spiræa salicifolia,* L.).—This free-growing bush, which not only produces large numbers of running roots or stolons, but also ripens much seed, was found to be covering many acres and spreading rapidly over some low spots in the central portion of the sand hill. This is a native shrub, common in all swamps and low lands. The Red Raspberry (*Rubus strigosus,* Mx.).—A form of this common shrub was seen covering a large area on the farm of Mr. Thomas McGregor, who has encouraged its growth, as well as some other native plants which occur with it. The common Blackberry (*Rubus villosus,* Ait.).—Even more luxuriant than the Red Raspberry was the Common High Blackberry, which rooted freely through the sand and threw up many stems. Both of these berry-bearing plants produce heavy crops of excellent fruit, and it seems as though they might prove a valuable resource to farmers, while at the same time performing the important office of providing a barrier against the encroachments of the sand or as a temporary shelter, while more valuable trees are being grown. Roses.—At various places old and vigorous clumps of Sweetbrier, which were evidently many years old, were seen, as well as of the little old-fashioned semi-double Cinnamon Rose. The Smooth Meadow Rose (*Rosa blanda,* Ait.) was found in spots, covering several yards in diameter and showing an unexpected power to grow up and keep its head above the drifting sand. Shrubs which also showed great vigour and which occurred in many parts of the sand hill, where evidently they had sprung up spontaneously, were the Red Osier Dogwood (*Cornus stolonifera,* Mx.) and the Beaked Hazel (*Corylus rostrata,* Ait.). Of the wild herbaceous perennials growing naturally on the sand, and the growth of which had to some extent been encouraged, the most noticeable were the Common Milkweed (*Asclepias cornuti,* Decne.), the Canada Thistle (*Cnicus arvensis,* Scop.), and Couch or Quack grass (*Agropyrum repens,* L.). There were also seen in some places a few plants of the Strawy Sedge (*Carex straminea,* Schk.), the Ox-eye Daisy and the Dandelion.

The trees which have been experimented with to the largest extent by farmers living in the locality are the White Pine, Canada Balsam Fir, the Norway Spruce, the White Spruce and the Tamarack or American Larch. Of these, the last-named has made the most rapid growth, but seems to require more protection than the sturdy spruces. The Balsam Fir has succeeded as well as the spruces, but is a less valuable tree. The Norway Spruce has been planted only to a small extent, a few hundred trees having been sent from this department three years ago. These were planted carefully, and doubtless will succeed; but it is too early as yet to compare them for this purpose with the White Spruce, which is the favourite conifer and is transplanted from the woods in the neighbourhood. The greatest satisfaction is expressed by all of the way in which willows have succeeded. The kind used for the most part is the large European Tree-Willow (*Salix alba,* L.) known mostly in this country under the name of French Willow. Large numbers of these trees have been started from cuttings and have in a single year made a remarkable growth, even from small cuttings put in with little labour in a furrow made by a plough. Such plantations were seen on the farms of Mr. John Doig and Mr. Walter Smith. On the edge of one of Mr. Doig's plantations the sand had been drifted away by the wind so as to expose the roots of one of his trees. These, by actual measurement, extended for forty feet from the central point, showing the great value of the willow as a sand binder, both from its rapid growth and from its great root production. An observation of much interest, as showing the power of the Canada Balsam to resist destruction by sand, was that this tree, when covered up to a certain extent with sand, threw out large numbers of roots from the branches which were partially submerged. (See Plate II., fig. 10.) Many samples of such branches were found upon trees which had their roots and trunks covered up with from six to ten feet of sand. Experiments with Beach Grass and the Sea Lyme Grass have been very satisfactory, particularly where the former has been planted on

exposed banks. In low, undisturbed spots the Sea Lyme Grass has succeeded rather better than the Beach Grass. Tufts of both of these grasses were found in some places to have extended four feet in each direction by the end of the second year, and on Mr. Walter Smith's land one clump was found which had a thick growth four feet across in the centre, with five smaller shoots round it and 18 shoots just showing through the sand, which will produce tufts of leaves next spring at a radius of twelve feet from the centre.

It is hoped next year to encourage this work by sending a large consignment of Beach Grass and several thousand cuttings of those willows and poplars which have shown the greatest vigour at Ottawa and at our western experimental farms. The enthusiasm and interest shown in this subject by the farmers themselves, every one of whom has already gone to much trouble and expense, is most encouraging. I can see no reason why in a few years this large tract of sand may not be brought under control.

Meetings.—Meetings of farmers, dairymen, fruit growers, &c., have been attended whenever other official duties would allow of my absence from Ottawa.

December 28, 1903 : St. Louis, Mo.—Annual meetings of the Society for the Promotion of Agricultural Science, of the Association of Economic Entomologists and of the American Association for the Advancement of Science.

January 29, 1904 : Cowansville, Que.—Convention of District of Bedford Dairymen's Association.

February 12 : Ormstown, Que.—Huntingdon Dairymen's Association.

April 18 : Perth, Ont—Horticultural Society and address to school children of the Public Schools in the town hall.

May 5 : St. Catharines, Ont.—Meeting of fruit growers to discuss the San Jose Scale remedies.

May 6 : Toronto.—Normal School : Address on Nature Study.—Toronto Branch of the Entomological Society of Ontario and Toronto Horticultural Society—joint meeting : Address on 'The Opening of Spring and Spring Work.'

June 14 : Amherst, N.S. ; and June 18 : Halifax, N.S.—Meetings of Maritime Stock Breeders' Association and Nova Scotia Farmers' Association.

June 21 to 24 : St. John, N.B. ; June 16 : Kentville, N.S.—Address before King's County Board of Trade on 'Orchard Insects.'

June 27 and 28 : Gagetown, N.B.—Address before Farmers' and Dairymen's Association on 'Farm Insects,' and attending spraying demonstration in orchard.

July 11 to August 11.—In Manitoba and the North-west Territories, holding weed meetings for the North-west government.

September 5 : Brome, Que.—Attending the Brome County Fair and judging horticultural exhibits.

September 9 to 17 : Halifax, N.S.—Attending the Nova Scotia Provincial Exhibition in company with the Dominion Live Stock Commissioner. Meeting farmers and fruit growers in the Farmers' Pavilion and delivering addresses on Noxious Weeds and Injurious Insects.

September 19 to 23 : St. John, N.B.—Attending Canada's International Exhibition and judging the natural history exhibits sent in by the school children of the province. This competition is worthy of special mention on account of the excellence and number of collections sent in. No less than 83 separate collections, aggregating nearly three thousand specimens, were on exhibition and formed a most attractive exhibit. For the most part, the specimens were well preserved, neatly mounted and labelled. The identifications in most of the collections were also as accurate as could be expected under the circumstances. On the whole, I believe that this competition was the most extensive and best managed of any similar effort which has ever taken place in Canada. The example of the Exhibition Association may well be followed by other similar institutions.

September 24 to 30 : Charlottetown, P.E.I.—Provincial Exhibition. Attending meetings and giving addresses in the Farmers' Pavilion upon Weeds, Hay and Pasture Grasses and Injurious Insects.

October 19 : Lachute, Que.—Visiting the Argenteuil Sand Hill and discussing with farmers means of controlling the drifting sand.

October 21 : Whitby, Ont.—Visiting the Model Fair Grounds with the Live Stock Commissioner and examining the illustration plots of various crops; and also the fodder crops grown in the district.

October 26 and 27 : London, Ont.—Annual meeting of the Entomological Society of Ontario : 'Injurious Insects of the Year,' 'Entomological Record for 1904.'

November 15 : Toronto, Ont.—Provincial Fruit, Flower and Honey Show: Address on 'The Value of Bees to the Fruit-grower.'

In addition to the above, Mr. Arthur Gibson attended the County of Carleton Annual Exhibition at Richmond, Ont., and judged the natural history exhibits made by the teachers and school children of the county. These exhibits were on the whole very satisfactory, and showed good careful work on the part of the teachers.

Mr. Gibson also attended the annual meeting of the Entomological Society of Ontario at London, and took an active and acceptable part in the proceedings, reading two papers : 'Further Notes on Basswood or Linden Insects,' and 'The Columbine Borer (*Papaipema purpurifascia*, G. & R.).

Acknowledgments.—I have again gratefully to acknowledge many favours from specialists who have assisted me with identifications of many specimens of insects received for the collections during the past year. My thanks are specially due to Dr. L. O. Howard, Chief of the Bureau of Entomology at Washington, and members of his staff, particularly Dr. H. G. Dyar, Dr. W. H. Ashmead, Messrs. Schwarz, Coquillett and Busck; also to Prof. J. B. Smith, of New Jersey; Mr. W. D. Kearfott, of Montclair, N.J.; Prof. J. S. Hine, of Columbus, Ohio, and Rev. G. W. Taylor, Wellington, B.C.

Valuable additions to the collections of insects have been made by the following:

Mr. F. H. Wolley-Dod, Millarville, Alta.—A collection of named noctuidæ from Alberta.

Mr. T. N. Willing, Regina, N.W.T.—Many specimens of insects of all orders from the North-west Territories.

Mr. Norman Criddle, Aweme, Man.—Many rare moths and other insects from Manitoba.

Mr. W. Metcalfe, Ottawa.—A large collection of minute diptera and other insects beautifully pinned, mounted and labelled.

Mr. A. W. Hanham, Victoria, B.C.—A large collection of pinned hymenoptera, diptera and hemiptera taken in Manitoba and British Columbia.

Mr. E. F. Heath, Cartwright, Man.—A collection of Manitoban moths in papers.

Mr. C. H. Young, Ottawa.—Specimens of rare moths taken at Ottawa.

Mr. E. P. Venables, Vernon, B.C.—A collection of named *Bombi* taken at Vernon, B.C.

Correspondence.—The correspondence of this Division has been sufficient during the past year to take up every minute of the time of the officers which could be spared from time necessary for investigation. Many thousands of specimens of insects and plants have been received from students for naming. This requires much time, but is of great value in the work of the Division in bringing the officers into contact with students all over the country and in learning of the occurrence of many insects and plants, which otherwise would not come to their notice. From December 1, 1903, until November 30, 1904, the number of letters, exclusive of circulars, registered in the Division as received on official business was 3,231, and the number despatched was 2,909.

I have the honour to be, Sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist.

DIVISION OF ENTOMOLOGY.

CEREALS.

The season of 1904 in all parts of the Dominion has been remarkably irregular and uncertain. Extensive areas have suffered from drought, while in other places there has been trouble from too much rain at certain periods ; crops, accordingly, have been very irregular. Through the greater part of the Maritime Provinces and in the eastern part of the province of Quebec, a prolonged drought during the months of June, July and August reduced enormously all hay and grain crops. In the western portion of the province of Quebec and in eastern Ontario, weather conditions were very favourable and excellent crops of grain and hay were secured. In western Ontario, on the other hand, and in the whole of the province of British Columbia, hot dry weather prevailed and somewhat reduced crops of all kinds. The Ontario November crop report describes the wheat crop as below the average and rather light in weight ; barley as one of the most successful crops of the year; oats a splendid crop, yield and quality most gratifying. Throughout the Dominion, however, the season on the whole has been cool and backward. In the North-west Territories and Manitoba the growing season began late; but with improved summer conditions and no killing frosts until rather later than usual, a large crop was reaped. The quality was not quite as high as was at one time hoped for, owing to rain at harvest time and slight frosts in some localities, and also to a certain amount of injury by rust. Rust is almost unknown in the West as a serious enemy of cereal crops; but during the past season a more severe epidemic of this destructive parasite made itself manifest towards the end of August than has ever previously been recorded. Mr. J. R. C. Honeyman, the Deputy Commissioner of Agriculture for the North-west Territories, although stating that the presence of rust last summer was a factor to be considered, claims that practically it did not affect the crops in the Territories to any appreciable degree. Writing on November 16, he says: 'There is a large amount of very good grain in the country, and prices are satisfactory. However, a comparatively small proportion of the crop has been marketed, owing to the continued fine weather, which enables farmers even at the date of writing to continue their fall ploughing.'

Mr. J. R. Anderson, Deputy Minister of Agriculture for British Columbia, writes : 'The abnormally dry season which extended through the whole of the province, had the effect of reducing considerably the production of all crops in those parts where irrigation is not practised, because it is unnecessary. Spring wheat was generally a failure where it is grown for milling purposes. Fall wheat was better, but on the whole, milling wheat was short. Nevertheless, some fine samples were produced. Kansas Red from Spallumcheen weighed 69½ lbs. per bushel, with a fine, hard, plump grain. Oats and other small grains were good where the seed was got in early, and on irrigated land. In dry regions these crops were indifferent.'

In Northern Alberta the summer was fine and dry, and grain crops were better than they had been for two or three years, except in some instances where poor seed oats had been sown. No mention was made of rust. In Manitoba, however, the injury by the Black Stem Rust caused great anxiety to farmers. Some crops were actually cut green or before they were ripe to save further damage. The districts most affected were between Brandon and Winnipeg and in the south and west of the province. Loss from this cause was not confined to the West. Reports from Ontario and Quebec mention rust on wheat, oats and barley, and a consequent shrinkage in those

crops. An undetermined injury referred to as 'Dead Heads' by settlers also occurred rather widely in Manitoba just before wheat harvest. Unfortunately, no cause for this injury which involved patches of from two to fifteen feet in diameter, could be discovered by my correspondents, who made investigations in accordance with suggestions sent to them. Neither fungus nor insect enemy could be discovered. Mr. Geo. H. Greig, Secretary of Live Stock Associations of Manitoba, wrote that the injury ceased about August 20, and that in speaking with the farmers in the district where this occurred, the opinion seemed to prevail that new land was worse affected than old, and he estimated the loss in the fields which showed most of the injury at about 5 per cent.

Among insects which have attracted attention by their numbers on cereal crops during the season of 1904, mention may be made of the following:—

WIREWORMS.—Wireworms in grain fields were complained of in New Brunswick, near St. John, on Prince Edward Island, at Kensington, and at Qu'Appelle in the North-west Territories. These troublesome larvæ, for which up to the present time no satisfactory remedy has been discovered, did much harm by eating into the young sprouting grains of wheat. It was noticed by Mr. William Henley, of Qu'Appelle, that oats sown on the same land where wheat was being destroyed, were not injured by the wireworms. The destruction of the wheat, however, was considerable. He writes under date June 20:—'Wireworms are destroying our wheat crop in the Wascana District (T. 13, R. 15, W. of II., 30 miles south of Qu'Appelle). This is heavy hummocky land full of humus. I broke a hundred acres last summer, disked it in the fall and harrowed it before and after seeding this spring. I shall not get over half a crop from it. I am breaking another hundred acres this summer, and should like to avoid this trouble next season, if possible. Would more cultivation in the spring have any effect on this insect, or would you recommend putting on extra seed? I don't think this worm does much harm after the wheat has germinated. We had two weeks of cold weather this spring after seeding, and the seed did not start to grow for some time. This was when the wireworms did most harm.'

A remedy which has given a measure of satisfaction to those who have tried it, is to plough the land twice in autumn—once in August, when the wireworms (the larvæ of several species of Click Beetles) change to the pupal condition, in which they are soft and easily injured, and then again in October or later, when the perfect beetles have formed but are still too soft and delicate to stand the cold of autumn and winter if their pupal cell is broken. This late ploughing also exposes them to many enemies. In the North-west, as Mr. Henley has pointed out, it is very rarely possible to plough land as late as October. The present open season, nearly up to the end of November, gives farmers a good opportunity to try this remedy. It has been noticed that oats are not so much attacked as wheat; and barley and rye are even less so, therefore, when land is found to be badly infested with wireworms, it will be advisable to sow other crops than wheat.

CUTWORMS IN GRAIN.—In the middle of July the 'Nor'-West Farmer' referred to the Division several complaints of injury to wheat crops by cutworms (Plate I, fig. 1), and specimens were received from Manitonas, Man. These proved to be the Red-backed Cutworm *(Paragrotis ochrogaster,* Gn.), which is a very general feeder, but, as a rule, restricts itself in a large measure to the weeds growing in grain crops, instead of attacking the grain. Occasionally, however, as in the oat crops of Manitoba in 1901, widespread injury was done by this cutworm; and, in 1900, as well as in 1901, several undoubted instances were reported of its attacking wheat. This bad habit, however, must be considered exceptional; and it is particularly to low vegetables and root crops that the Red-backed Cutworm does harm. The Glassy Cutworm (*Hadena devastatrix*, Brace), a greenish white caterpillar with a red head, which works beneath the ground, damaged wheat fields seriously in the neighbourhood of Virden, Man.

In grain fields it is difficult, as a rule, to apply remedies for cutworms; but, as many of the different kinds assume a marching habit as they clear away the food be-

fore them, it is frequently possible to prevent damage to a large extent by applying poisoned bait in advance of their line of march. The poisoned bran remedy, which gives such remarkably good results against all surface feeding cutworms, is probably the best form of bait. This can be scattered lightly through the grain near the spots where the caterpillars are numerous, and the small particles of bran will be found by the cutworms, which eat this material with avidity. For the Glassy Cutworm, which feeds almost entirely underground, this remedy would be of little avail, and the best means of combating this insect is to keep the land to be used for small grain crops the following year as free as possible from long grass and weeds in the autumn before. Prairie or sod land which is to be broken for seeding the next year should be fed off as late as possible or mowed before breaking. In this way the female moths will not be attracted to the tall vegetation on such land when laying their eggs.

GRASSHOPPERS.—I visited the districts in Central Manitoba lying between Treesbank and Douglas in the middle of July, and saw no traces of injury by locusts. Mr. N. Criddle, of Aweme, writes under date of November 1: 'As was anticipated, locusts did not hatch out in sufficient numbers to cause any loss to farmers in this district. A few reports of their being unduly numerous were heard in the spring from places south-east of here; but, as far as I can learn, very little, if any, damage was done. The gradual disappearance of these troublesome pests seems to have been brought about chiefly by the multiplication of their well known parasites, mention of which was made in my last year's report.'

The kinds of grasshoppers which have been devastating the crops in Central Manitoba for the last four years are the Rocky Mountain Locust (*Melanoplus spretus*, Uhler), the Lesser Migratory Locust (*M. atlanis*, Riley), and Packard's Locust (*M. packardii*, Scud.). The two parasites referred to by Mr. Criddle are two blister beetles, *Epicauta sericans*, Lec., and *Epicauta pennsylvanica*, DeG., as well as two or three kinds of *Tachina* flies.

In some of the dry regions of British Columbia another species of locust, *Camnula pellucida*, Scud., appeared in a few places, and did a good deal of harm on the ranges. Mr. George Packham, of the Plateau ranch, Okanagan Mission, writes on June 25: 'Grasshoppers are coming out in thousands again this year. Last year they destroyed most of the crops and damaged the young orchards considerably. Is there nothing that can be done to check them? Is there not a fungous disease that the Australian government supplies to settlers? If so, could not our government supply it to us at cost price? It is important that we get it immediately, or we shall lose acres of vegetables and thousands of young trees.' In view of the great success which had been obtained by Mr. Criddle in controlling vast hordes of grasshoppers in Manitoba in a practical way with the Criddle mixture, I recommended Mr. Packham to try that mixture in the Okanagan country. It has been noticed that the Pellucid Locust, which was the species there prevalent, has the habit of occurring in dense swarms in rather restricted localities, and therefore gives a good opportunity for the application of poison.

The Criddle mixture, for convenience, is made in quantities of half a barrel at a time. It consists of fresh horse droppings 100 parts, Paris green 1 part (=1 pound), and salt 2 pounds, dissolved in half a pail of water, and the whole mixed together. In this connection, Mr. Criddle says: 'We usually measure with a three-gallon patent pail, because it is more convenient to farmers than to weigh the material. Five pails we calculate approximately equal 100 parts of horse droppings, and each part equals in bulk one pound of Paris green. The great drawback in using weights is that horse droppings are not always of the same weight.'

The propagation and wholesale cultivation of the fungous disease for the destruction of grasshoppers of all kinds, which is mentioned by Mr. Packham and has been inquired about from time to time by many other correspondents, I regret to say, has not proved to be, on the whole, of much service in fighting outbreaks of injurious locusts.

For a short period, and in restricted localities, with all conditions favourable, good results have occasionally been obtained; but the difficulty of preserving the spores alive and using them when required, has been so great that all entomologists who have experimented with the fungus have, after a short time, relinquished the effort in favour of other methods not so dependent for their most effective use on climatic conditions. Hopper dozers and other mechanical contrivances have proved of much service; but the best results have followed agricultural methods of control, such as the early ploughing down of all stubble lands, in which by preference the eggs are laid, before the young emerge in spring or have grown to such a size as to be able to save themselves by hopping or flying, so as to avoid being ploughed down and buried.

The HESSIAN FLY *(Cecidomyia destructor,* Say.).—Injury by this destructive enemy of the wheat crop has been slight this year. Most reports merely refer to its absence. Last year specimens were found as far west as Indian Head, N.W.T. In Manitoba it has done less harm by far than in 1903. Mr. Norman Criddle, who has been on the lookout for it, says: 'The only report of this insect comes from Mr. Cooper, of Treesbank, who states that quite a number of puparia were to be found on his stubble fields this autumn and that he estimated the damage on his farm at about half a bushel to the acre. Elsewhere in the province, it is just possible that this insect may have escaped notice on account of the damage done by rust. There was no appearance of Hessian Fly here at Aweme.'

Prof. F. M. Webster, who is making a special study of wheat insects in the United States, writes at the end of this season: 'I found Hessian Fly in large quantities in North Dakota, quite as bad as in many places further south. You will be interested in hearing that from a lot of stubble collected west of Fargo, I have not reared a single adult this autumn; but from stubble collected at Lincoln, Nebraska, we get plenty of adults, showing that there must be a dropping out of the fall brood somewhere between these two localities.'

This observation confirms the opinion that there is only one brood of the Hessian Fly each year in our western wheat fields. This is an important fact, as indicating a proper remedy, and shows the value of cutting wheat high and then burning over the stubble before the time when the flies emerge in spring. In the Ontario November Crop Returns we find: 'The crop suffered much less than in recent years from Hessian Fly and other insects;' and 'in the new fall wheat little injury was complained of, compared with the ravages of this pest during the past three or four years.' In Prince Edward Island, where the Hessian Fly is always present to some extent, little harm was done, but specimens of infested straws were received from Mr. A. M. McMillan, of Eldon, P.E.I.

WHEAT-STEM SAWFLY [*Cephus pygmæus*, L. (?)].—The intermittent manner in which this insect attacks wheat in the North-west was again demonstrated this year. It was not reported from any of the localities where it did harm during the past two years. The only place where a crop was injured conspicuously was at North Portal, Assa. Mr. George Harris writes under date August 24: 'I send samples of wheat injured by a small white worm. The attack is worst on the edges of fields, but is present all through the grain. Where the plants stand thick, you can cut with a binder; but where thin, the wheat falls down and there are patches three and four feet square, which are quite flat.'

The worm which causes this breaking of the straw is the larva of a slender black four-winged sawfly, about one-third of an inch in length, banded and spotted with yellow. The eggs are inserted into the straw by the females near the top of the stem; and the grub on hatching eats its way down to the root, near which it passes the winter in a cocoon spun inside the stem, but above which it has first gnawed almost through the walls of the straw, so that about harvest time injured stems fall over easily and break off, leaving the grub inside the stubble, where it remains, and about June of the following year turns first to a pupa and then to the perfect fly. Burning over

stubble fields and ploughing down all land left for summer-fallow early, so that the cocoons may be destroyed by the burning or buried so deeply that the flies cannot emerge, are the remedies recommended.

The GRAIN APHIS *(Nectarophora granaria,* Kirby).—It is probable that two or three species of plant-lice have been spoken of collectively by correspondents under the name of the Grain Aphis, as there is a remarkable difference in the appearance and colour of many of the plant-lice described in their letters, and very few send in specimens of what they consider a so well known insect. The grain plant-lice were more complained of this year in the West than any other enemies of cereal crops. They were exceedingly abundant in many places, and did some harm by sapping the stem and grain and causing shrunken wheat. Specimens were sent from New Brunswick by Mr. W. H. Moore, of Scotch Lake, and reports of unusual abundance were received from several places in Ontario. Nevertheless, there was little appreciable injury to grain crops in the East. In Manitoba and the North-west grain plant-lice were in places so abundant as to cause a good deal of anxiety. Mr. T. N. Willing, the Chief Territorial Weed Inspector, of Regina, reports that the Grain Aphis was very plentiful at some points, particularly north of Wapella, N.W.T. 'They were so abundant on Mr. F. Carr Dufton's farm, Wapella, and that of Mr. W. M. Gordon, Hazelcliffe, that the binder was actually stopped by reason of the canvas slipping on the rollers, from the slipperiness caused by the crushed plant-lice, and these were cleared off from the platform by the shovelful.'—T. N. WILLING.

'Pilot Mound, Man., Aug. 17.—I send wheat heads attacked by the Grain Aphis. I have a large acreage in which the grain is infested; but the only harm I can see that they do so far is to delay ripening. In walking only a short distance into the standing grain my clothing became covered with these insects.'

'Aug. 28.—The plant-lice which were so abundant when I last wrote, soon afterwards suddenly disappeared. They got wings about August 18 and flew away, I hope, never to return.'—PHIL. W. ROBINSON.

'Winnipeg, Man., Sept. 6.—We send sample of wheat received from a farmer at Wawanesa, Man. You will notice that it is affected by a small insect which is working on the head. The farmer writes : "The heads of the wheat are covered with a small insect of a green and black colour, which seems to be a bad pest. The heads of the wheat are covered with them and there must be millions in a single field. They seem to be sucking out the juice of the straw and the berry.'—W. J. BLACK, Editor *Farmers' Advocate.*

'Yorkton District, Assa. (30.25.2.W. of 2nd), Sept. 13.—There was an insect on the grain this year which, had it come sooner, would have done a great deal of damage. There are millions of them on the oats, and I understand they are on the wheat also. They cluster around the kernel.'—A. C. GIBSON.

So far, no treatment has been discovered for controlling plant-lice on grain crops; but fortunately, they very seldom affect the output to any considerable extent; for an excessive occurrence of these insects is invariably attended by a correspondingly abundant development of parasites which feed upon them.

The WHEAT MIDGE *(Diplosis tritici,* Kirby).—It is many years since any noticeable loss from the larvæ of the Wheat Midge, usually called 'The Weevil' by farmers and millers, has taken place. Fifteen years ago the injury through the country was enormous, but suddenly, about 1889, the insect practically disappeared from our wheat fields. In 1898 a rather severe outbreak—the loss amounting to about 25 per cent of the crop—appeared as suddenly in the Niagara Peninsula, particularly along the lake shore in the county of Lincoln. Nothing has been heard of the Wheat Midge since that time, there or elsewhere, until the past summer, when specimens were sent from the fertile Chilliwack district of the Fraser River valley, in British Columbia. Mr. J. R. Anderson, in his report on the crops of the year, says : 'The Wheat Midge

(Diplosis tritici, Kirby) made its appearance at Chilliwack, but does not seem to have shown itself elsewhere. Where noticed, the infested wheat was destroyed by fire.'

Specimens of wheat heads more heavily infested than any I have ever seen, were received from Mr. Henry Kipp, of Chilliwack.

'Chilliwack, July 27.—I enclose heads of wheat infested by a small red maggot. There were a few last year, but this year my field is ruined. Please let me know what it is, and send a remedy if there is any. I believe there are hundreds of acres more or less injured by this insect. You will be doing the farmers of this district a great favour if you publish a remedy for it so that we may be ready to protect ourselves another year.'—R. ROBERTS.

'Chilliwack, July 28.—I enclose heads of wheat infested with a little red insect, which is attacking all the wheat crops here. Is there any remedy? I suppose not, as the wheat is so far advanced and is just beginning to ripen. I hear rumours of barley being attacked. So far, oats and peas are not.. I see under the microscope this little insect resembles a minute worm. Most people, including myself, are going to cut the wheat green.'—G. MAXWELL STUART.

'Chilliwack, Nov. 24.—As far as I can hear, wheat was damaged by the Wheat Midge more or less all over the lower Fraser valley; the extent of the injury varied according to locality and to the state the wheat was in when the Midge attacked it. On the whole, the average would be, I think, less than one-third of the crop for the turn out. I heard of one farmer who only got 10 sacks of wheat off 10 acres; another got 25 bushels off five acres; he estimated the crop, before the Midge attacked it, at at least 20 bushels to the acre. On the other hand, Mr. Evans, of Sumas, had his wheat in very early; and it was not injured at all. I suppose the wheat had got too hard for the Midge; and for the same reason the fall wheat here was not hurt at all. I do not put in much wheat, my land being better suited for clover and peas; but off two acres which looked very well before the Midge came, I got only about two sacks. A good many cut their wheat for hay as soon as they knew it was attacked. Do you think this insect is likely to occur again next year? It would be a useful hint to farmers if you could include in your report a suggestion as to whether it would be wise to sow much wheat or not.'—G. MAXWELL STUART.

As to sowing spring wheat next year in the Chilliwack valley, it would certainly be wiser not to do so, but to use the land for some other crop such as oats or barley, which are not attacked by the Wheat Midge. It is, of course, possible that the Midge may not be abundant next year; but it is much more likely to be present in some numbers, which would make it unwise to grow wheat when the land can be used for so many other valuable crops.

'Chilliwack, November 28.—*Re* losses from Wheat Midge in this valley, I may say they were even more serious than I first thought. After attending a number of threshings, I am sure fully half of the wheat crop was destroyed by it; there would be found several bushels of the grub underneath the machine after it had worked one or two hours. But a few like myself cut their wheat and made hay when the insect was found to be bad.; but I may say the loss was not felt as bad here as it would have been in a wheat-growing district; for the farmers here only grow wheat for feed, and only a comparatively small acreage is annually sown to wheat; so the loss, although considerable, will not be felt very much, and the chickens will have to eat something else. I notice an increase in the acreage of fall wheat sown this fall; for, strange to say, the insect does no harm to fall wheat, and a few fields of very early spring wheat escaped the Midge. I have just rubbed out a few heads of the wheat which I cut for hay, and find the grub still there, with no change, as far as I can see, since I first noticed it.'—R. ROBERTS.

All the samples of infested wheat received were remarkable for the enormous numbers of the larvæ clustered round the grains in each floret; and, although few farmers reported injury by the Midge, this was without doubt great where the insect

occurred. Immediately on receipt of the samples an article was prepared for the *Province* newspaper of Vancouver, B.C., in which the insect was described and the best steps to take were mentioned, so that as much as possible loss might be minimized in the future. The Wheat Midge possibly attacks some grasses, but has never been detected, as suggested above, on barley nor upon oats and peas.

The Wheat Midge and its attack are thus described in my report for 1888, page 49, which I reprint here, as I have nothing further to add to it in the way of useful information:—

'The Wheat Midge is more widely known in Canada under the inaccurate designation of 'Weevil,' a term which must be discouraged, because it belongs to another class of insects altogether. The weevils are hard-shelled beetles, with elongated snouts, while the Wheat Midge in its larval stage is a legless maggot, and, when in the perfect state, a delicate gnat-like creature with gauzy wings. The life history of the Wheat Midge, as at present understood, is as follows:—During the month of June, just when wheat is in blossom, tiny yellow midges with black eyes and yellow bodies may be seen flying over the fields, particularly on dull days or towards evening. Large numbers of the same midges may also be seen in houses as soon as the lamps are lighted. These are the Wheat Midge and the parents of the Red Maggot of wheat.

'The body of the female fly is prolonged into a long slender tube which can be extended or drawn in at pleasure. With this tube, which is called the ovipositor, she pushes her minute eggs down between the chaff of the green wheat ear. In about a week these eggs hatch into small transparent yellowish maggots, which at once attack the forming grain. Gnawing through the outer skin of the kernel of wheat, they extract its juices and prevent it from filling out properly. As these larvæ grow older, they gradually become darker in colour until they acquire the tint which has given them the name they are best known by in England, "the Red Maggot of the wheat." Grain injured by the Midge has a characteristic shrivelled appearance, known amongst millers as "fly struck." There are sometimes four or five maggots to each grain in an ear.* As soon as the maggots are full grown they either work their way up between the scales of chaff and fall to the ground, or remain in the ears until the crop is carried. Those which fall to the ground—and these are by far the most numerous—penetrate about an inch beneath the surface, where they spin a small cocoon of exceeding thinness, which fits so closely to their bodies that it is sometimes thought to be only the skin hardened, in the same manner as takes place in the case of many other flies when they pass through their pupal or quiet state. It was generally supposed that the perfect flies from these pupæ did not appear until June in the following year. This, however, is not always the case, for, on a warm, damp evening in August, and again in the beginning of September, 1888, large numbers flew into my study and were killed at the lamp. Prof. F. M. Webster, a special agent of the United States Department of Agriculture, on one occasion bred considerable numbers of perfect Midges in the month of July, from heads of wheat which had been badly attacked by the red maggots during the previous month; and, off and on, during the rest of the summer until November, he caught the perfect insects at large. In the report of the United States Entomologist for 1884 the same observer records as follows:—"From September 4 to 15, I not only found larvæ in considerable abundance under the sheaths of volunteer wheat, but adults too in the same situation, and also on the outside of the plant or hovering above the upper leaves. From a quantity of this wheat placed in a breeding cage, on September 7, appeared three or four adults." Not only, then, did these maggots of June produce perfect flies that same summer, but there was a second brood which had time to lay eggs in the young fall wheat. That this insect has a double life history, living both in the ears and later in the season in the shoots of young

*There were from 10 to 15 in almost every instance with each grain in the heads sent from British Columbia this year.

wheat plants, is an important discovery made by Prof. Webster, and suggests another means of checking its ravages.'

Remedies.—The remedies for the Wheat Midge, as for all other insects which attack crops, depend largely upon its habits and the way in which it passes the winter. Those methods which have given the best results are as follows :—

1. Deep ploughing directly the crop is carried, so as to bury the larvæ so deep that the flies cannot work their way out through the soil.

2. The burning of all chaff, dust and rubbish known as 'screenings' or 'tailings' from beneath the threshing machines, as these contain many of the larvæ which are carried with the crop. If fed to chickens or domestic animals, this should be done in a place where none of the puparia can escape destruction.

3. Clean farming, including the cutting of all grasses along the edges of fields and the ploughing down of all volunteer crops found in wheat fields before winter sets in, so as to destroy an autumn brood where one exists.

4. The cultivation of such varieties of wheat as experience has shown are least affected by this insect. There is a great difference in kinds of wheat in this respect, and from time to time so-called 'midge-proof' varieties have been introduced, but it is probable that there is no truly midge-proof variety of wheat as yet known.

The PEA WEEVIL *(Bruchus pisorum,* Linn.).—The satisfactory state of affairs referred to in my last year's report as to the sudden and remarkable decrease in the numbers of this pest has continued, and, even to a greater degree, during the summer of 1904. This sudden cessation of activity on the part of such a persistent enemy cannot be accounted for by any one cause; but it must be claimed to be due, to some extent at any rate, to the persistent work which has been done by entomologists in stirring up farmers to greater care in treating their seed pease before sowing them, and in harvesting and treating the crop as soon as possible after it is ripe. Many farmers, for fear of loss from the depredations of the Pea Weevil, gave up growing peas altogether during the last two seasons. In 1903 the numbers of the Pea Weevil were perceptibly reduced, but no natural parasites such as frequently bring down the numbers of other insects when they increase unduly, could be detected to account for this. The winter of 1903-4 was more severe, both from its duration and the intensity of the cold than has been experienced for many years. There is no doubt that the cold weather destroyed many of the weevils which had emerged in the autumn and were hibernating around barns and buildings. It is probable, too, that many of those still remaining in the seeds through the winter were also killed by the cold. In some rather extensive experiments carried on during two or three years to decide whether there was any exact limit to the low temperature which could be borne with impunity by the Pea Weevil, I found that beetles exposed inside the pease, both with the skin of the pea intact or with the cell cap pushed off, were killed at between 18 to 20 degrees below zero, Fahr. On several occasions during last winter the thermometer dropped lower than 20 degrees below zero, Fahr., in those districts of Ontario where the best seed pease are grown. Mr. Geo. E. Fisher, a practical farmer and careful observer of insect life, writing from Burlington, Ont., on September 29, says : 'The pea crop here is now being threshed. It is a good crop and characterized by the entire absence of bugs. This substantiates my contention that cold weather settles the Pea Bug. I believe there will be a large acreage put in to peas next year.'

Prof. C. C. James, in his November crop report for Ontario, says : 'The round or common field-pea has not been widely sown during the past three or four years owing to the weevil or "bug." The yield and general quality of pease this season, however, will do much to restore confidence in the growing of this crop. The injury from weevil was comparatively slight, and a larger area of peas may be looked for next year.'

Mr. J. D. Evans, President of the Entomological Society of Ontario, who has made inquiries for me in Prince Edward county, one of the most important districts in Canada for the production of first-class seed and pease, writes on November 11: 'The Pea Weevil was not destructive at all this year; in fact, it seems to have entirely disappeared. There were none found at Picton, Bloomfield, Wellington, Trenton or Frankford. Mr. Cooper, of Bloomfield, and Mr. W. P. Niles, of Wellington, both well known to you as first-class men, report its apparent disappearance in the above-mentioned localities.'

I draw special attention to the great diminution in the numbers of the Pea Weevil at the present time, in the hope of inducing growers to avail themselves of this exceptional opportunity of pressing home their advantage now when the infestation is so slight, and when, therefore, every insect killed is of much greater importance in the conflict than when Pea Weevils are occurring in the incredible numbers in which they existed in Canada only three years ago. I again repeat that I can see no reason why the Pea Weevil should not be entirely wiped out in Ontario.

There are special features about the attack of this insect which render its control a simpler matter than is usually the case with injuries of an equal magnitude. The Pea Weevil is not a native of North America, and has no other known food plant than the cultivated pea, which, being an exotic plant, will not live over the winter in our climate if seed is left in the open field; consequently, every seed sown for the pea crop of the year must, before it is sown, have been under the control of some one by whom it could have been treated before sowing to destroy the contained weevil if it had one. Fumigation with bisulphide of carbon is a certain, effective, easy and cheap remedy, which is well known and can be applied by any one. If all growers of pease, will combine to do this this year, when on account of the cool season of 1904, it is not likely that many of the weevils have left the seed, by far the greater number of the Pea Weevils now remaining in the country can be destroyed before another season opens. This, however, alone will not be sufficient. The knowledge of the life history of the insect must be made much more widely known to farmers than is the case; for, notwithstanding all that has been written on the subject and the attention which has been given to it at farmers' institute meetings, I have received during the past season a great many inquiries as to the best means of treating pease before sowing; and further steps must be taken at the proper time of the year to spread more widely a general knowledge of the subject, so that those growing seed and sowing pease, may understand the reason why certain steps are advised. My recommendations are :

1. That all pease for seed should be treated before they are sown, whether the weevil is thought to be present or not, and that seeding should be as early as can be, so as to get the crop ripe and ready for treatment at the earliest possible season.

2. That pea-growers should harvest their pease as much on the green side as is safe, rather than, as is usually done, waiting until they are dead ripe. This has many advantages; not only is the straw of much higher quality for feed, but the seed is heavier and better for every purpose. The pease should be threshed as soon as dry enough, and then fumigated at once. The weevils will not have completed their growth and will have destroyed a smaller proportion of the bulk of the seeds than if they were left until later in the winter. It is certain that weevils in all stages of growth may be killed inside the pease by fumigating with bisulphide of carbon. Consequently, if growers will sow early and harvest and thresh a little earlier than usual, and either themselves treat their seed immediately or sell to the grain buyers, who for their own sakes will do this, much good must surely result. When for any reason pease cannot be treated at once or disposed of, they should be bagged up and the sacks tied up immediately so as to prevent the escape of any weevils which might emerge in the autumn. When the grain is required for feeding, and therefore it is thought not necessary to fumigate, pease should be ground as soon as they are dry enough; and, for the convenience of grinding and to prevent the meal from becoming musty, some old pease should be mixed with the new before passing them through the grain grinder.

3. That everybody who understands the gravity of this question should use every endeavour to persuade all growers of pease to abstain from sowing any pease which contain living weevils, and, when purchasing seed, to refuse determinedly to buy any without an assurance from the seed merchant that they have been treated, and, even with this assurance, to examine for themselves to see that any contained weevils are really dead. There are two points which should always be remembered by those who purchase pease for sowing. Seeds which have been injured by weevil are so much reduced in vitality and producing power that they are only worth about one-quarter as much as sound seed, and also, that treatment with bisulphide of carbon in no way injures the pease, whether they are to be used for seed or to be fed to stock.

FIELD CROPS.

The irregular nature of the weather during the summer months of 1904, which has already been referred to under cereal crops, was manifested even more plainly by its effects upon fodder crops. Good hay crops were the exception, perhaps the best being secured in western Quebec and central and northern Ontario. Corn was nowhere heavy nor well developed. Complaints of poor seed were frequent; but it is possible that some of the disappointment was due rather to weather conditions than to lack of quality in the seed. Late spring frosts did some injury, and early frosts in autumn reduced very much the weight of ensilage corn per acre. The Ontario returns sum up the crop as follows :—'Corn for the silo is described by some as being of inferior quality, while many others claim that it will be good or of fair quality. Taken altogether, however, it has been a decidedly poor year for corn.' In the Maritime Provinces and Quebec some injury was done by cutworms, necessitating replanting and a consequent retarding of the crop, so that it was caught by frost in the autumn. The drought which prevailed from the Temiscouata district in Quebec to the sea coast reduced enormously hay crops, which up till the first of June were apparently in a flourishing condition. Writing of the climatic conditions in Prince Edward Island, the Rev. Father Burke says :—'The season opened with much promise, and there was more soil moisture than we have had for several years. The weather was warm and genial, and the opportunity for getting the crop in was unexcelled. Towards the end of June, however, the complete absence of rain began to be felt, and, as almost every day we had high winds from the south-west, growing crops became a greater concern to farmers. We had merely a few insignificant showers till away on to the last of September, so that grass and all forage crops were seriously affected. Hay was not half a crop, and grain in land not particularly rich in humus very poor indeed. We are exceedingly short of fodder, and the government is importing hay from Quebec to prevent the wholesale slaughter of cattle.'

A much brighter report comes from British Columbia, notwithstanding that large areas were affected by drought. Mr. J. R. Anderson reports grasses and clovers as giving 'good yields throughout the province, and on account of favourable weather hay was mostly well cured. Red clover, alfalfa, sainfoin and alsike in different localities gave some surprisingly large yields on irrigated lands, as much as three crops being cut in places. Timothy is largely grown, but its production is discouraged, as other grasses are preferable for pasture.'

Insect enemies of these crops were not complained of to any large extent; but this cannot be taken to mean that no injury was done. Enormous losses may be sustained in hay and fodder crops without farmers noticing the fact. Then, again, some losses have become so much a matter of every year occurrence that no mention is made of them in reports. This is particularly the case with the Clover-seed Midge, to which I

have drawn attention very frequently. The annual loss at the present time is enormous, and yet, if those who grow clover seed practise the simple remedy of feeding off or mowing the first crop before June 20, the results are always so satisfactory that I cannot understand why the practice is not more generally adopted.

Mr. G. H. Clark, Chief of the Seed Division of the Department of Agriculture, who has exceptional opportunities of learning the condition of crops throughout the country, writes to me as follows:—

'Ottawa, Nov. 30.—Referring to your inquiry about the condition of the clover seed crop for 1904, I have to say that our instructor in seed-growing for the province of Ontario has reported that, on account of the severe winter, the crops of alsike and red clover in June and later months appeared patchy, and, in consequence, a much smaller area was left for seed crop than in previous years. Mr. Newman also inspected fields of red clover that had been left for seed in nearly all of the districts where red clover seed is extensively grown, and found in practically every county that the crops had been badly injured by the midge. These conditions, together with the unfavourable weather for ripening the seed, would indicate that the clover seed crop of 1904 will fall considerably below the average.'

Further efforts will be made next season to draw the attention of the clover seed growers to this important matter; and it is to be hoped that a reduction may be made in the great amount of loss which is now taking place every year. Letters appeared in the newspapers last year at the end of June, advising the best steps to take and a few farmers followed them; but the result of the clover seed harvest of this year is very unsatisfactory. The plants in many places suffered from the severity of last winter, and there was a great deal of winter-killed clover in spring. Alsike seems to have suffered even more than red and mammoth clovers, and red clover in all parts of the province of Ontario was injured by the midge. In travelling over part of New Brunswick and in the Annapolis valley of Nova Scotia in June last, I found red clover in almost every section badly attacked by the midge.

The CORN WORM (*Heliothis armiger,* Hbn.).—From time to time complaints are received from various parts of the country of more or less injury to sweet corn in autumn by the caterpillar of a noctuid moth, which is known by various popular names. It is what Professor Lugger called the Sweet Corn Moth, or Tassel Worm, in Minnesota, and is also the same as the notorious southern 'Boll Worm' of the cotton, to which crop it frequently does great damage and for which it has been found very difficult to find a practical remedy. The name of widest use is the Corn Worm, although its injuries in Canada are not confined to Indian corn, for the caterpillars have also been found boring into the fruit of tomatoes and attacking many other plants. There is but one brood in the year in Canada, the caterpillars occurring in autumn and the moths from these emerging the following summer. The worst injury by this insect in Canadian crops is to the cobs of sweet corn, because the work of the caterpillars renders the ears unsightly and discoloured so as to be unfit for the table.

In 1898 there was a bad attack at Orillia, Ont., when as much as 95 per cent of the ears of both sweet corn and yellow field corn were injured. There were other outbreaks in the same year in western Ontario and at Ottawa. These caterpillars do not appear till late in the season, generally during the months of September and October, when they may be found of all sizes, eating the young grains near the tips of the ears, frequently as many as five or six caterpillars working in the same ear. As they approach full growth, when they are an inch and a half in length, they frequently eat their way out of one ear and attack another one.

The only account of injury by the Corn Worm this year comes from Nova Scotia, and is the first record I have had of injury by it in that province.

'Mahone Bay, Sept. 7.—I send you under separate cover specimens of what is to us a new pest. It affects garden corn in the way you will see by the portions of seve-

ral ears I am also sending. There are from one to three of the caterpillars in each ear, and, of about 45 ears picked by me, so far only five were free from them. This pest seems quite general here, and at least for eight or ten miles around. One man only, of all I have asked about it, tells me that his corn is not affected. After a while the caterpillars make a round hole through the husk and disappear, I suppose, into the ground, although I have vainly hunted for them in the ground about the corn roots.'—CHARLES A. HAMILTON.

The caterpillar is somewhat variable in colour, and is from one and a quarter to one and a half inches in length when full grown. The head is honey yellow, and the body varies in colour from pale greenish to dark brown, and is marked with longitudinal dark stripes and with a conspicuous band along the sides where the breathing pores are situated. This band is white, mottled with pink. On the body are the ordinary tubercles which are found on noctuid larvæ. These are distinct and black, each one bearing a slender bristle. The upper surface is marbled irregularly with white, and the whole surface of the skin has a velvety appearance, owing to numberless very short bristles, which are black and white in about equal numbers. A single specimen, which turned out to be a caterpillar of this moth, was found in a greenhouse late in the year (October 28). It was full grown and buried in the ground on October 31. The jar containing it was kept out of doors for the winter, and the moth emerged on July 8 the following year. This caterpillar was remarkably unlike those occurring on corn the same year, being entirely dark velvety green, without conspicuous markings, and was feeding on the leaves of a scarlet geranium. This moth, however, is by no means a common species in Canada, and nearly all of the specimens I have seen have been taken late in the year. Prof. Lugger states that the insect does not winter in Minnesota, but that all are killed late in the fall. This, he points out, would mean that the insect has to be reintroduced every summer from the south, where it can successfully hibernate. Whether the insect also hibernates as a moth in Canada, I have been unable to decide, but it certainly passes the winter in some instances as a pupa, although the caterpillars vary so much in size late in the year that many of them must be caught by early frost, which destroys their food plant. The moth of this insect is somewhat variable in the intensity of colour, but is usually of a dull pale ochreous yellow, with olive or ruddy markings on the forewings. The yellowish hind wings have a broad blackish band, and are edged with pink. These moths expand a little more than an inch and a half from tip to tip of the opened wings.

The caterpillars of the Corn Worm are recorded as having been found on a great many different kinds of plants, including the following crops: Pumpkins, tobacco, beans and peas; and the full grown caterpillars seem to have a penchant for eating into any solid firm object, such as a fruit or pod of any kind.

Remedies.—Unfortunately this is a very difficult insect to keep in check. When it attacks corn, as described above, it is seldom noticed until a considerable amount of harm has been done. Where the caterpillars are troublesome regularly every year, growers, it is claimed, get into the way of recognizing at a glance, ears which are infested, by the discoloration of the silk earlier than is natural in perfect ears. As soon as an infested ear is discovered, the leaves of the husk are pulled back and the caterpillars destroyed by hand. Where, as in Canada, it is only at long intervals that harm is done in any one place, corn growers are taken by surprise, and the injury is done before it is noticed. It is claimed that many of the moths may be taken in lantern traps consisting of a lamp standing in an open pan containing water with a little coal oil on the top of it. Anyone, therefore, who knew the appearance of the insect, upon recognizing the moths in years of great abundance flying around lights at night, might place lantern traps as described above in his crop, and thus prevent future loss; but this insect, like many others which appear in an intermittent manner, will always be a source of trouble. On fields where a crop of corn is known to have been attacked by the Corn Worm, the old stems should be removed from the field as

soon as the crop is gathered, and the land ploughed deeply in autumn so as to break up the cocoons and expose the pupæ to the weather and their various enemies among the small birds and mammals.

The Black Army Worm *(Noctua fennica,* Tausch.).—This cutworm was found in small numbers at Ottawa, chiefly in gardens and clover fields, but no great harm was done. There was a serious occurrence of the insect at St. Emile de Suffolk, Que. Mr. Elsimère Guérin wrote on May 27 : 'This spring I sowed 13 bushels of peas, which have been destroyed by the caterpillars of which I send you specimens. They are beginning to attack my oats. Can you tell me what I can sow in place of the peas without loss ? Also, if there is anything I can use to destroy the worms ?'

The samples sent were full grown specimens of the Black Army worm, which is a velvety black caterpillar with red head and legs and is striped down the back and sides with distinct but fine white lines. The dorsal area is sometimes more or less washed with a reddish tinge. There is a distinct white waved stigmatal band, washed with yellow and bearing in the centre an irregular black line. The lower side of the body of these caterpillars is a dusky green mottled with white. They become full grown about the end of May, when they burrow into the ground and turn to chrysalids, from which the moths emerge in July. In reply to Mr. Guérin's question, he was advised to leave the pea field and see if the plants did not recover, this having been our experience at Ottawa in 1891, when from a field similarly injured a heavy crop of peas was harvested. Later in the year Mr. Guérin wrote to me that he had reaped a heavy crop of peas from this field.

The Cottony Grass Scale *(Eriopeltis festucæ,* Fonsc.).—In the report of the Entomologist and Botanist for 1895, some account is given of a curious scale insect which has occasionally appeared in vast numbers in pastures and meadows in Nova Scotia and Prince Edward Island. From time to time specimens of the egg-sacks of this scale insect on grass (Plate I., fig. 4) are sent in for information, and apparently the species is not uncommon in the Maritime Provinces. During the past summer I observed small colonies in many places, and Mr. W. H. Harrington tells me that he also found them very abundant near Sydney, C.B. Mr. Charles Myers sent specimens from Lake Verd, P.E.I., with the statement that in many places, both in new meadows and on old sod, almost every blade of grass had one or more of the scales upon it.

This insect passes the winter in the egg condition beneath the scales. The young hatch in spring and feed on the leaves and stems of grass. The females become full grown in July, and towards the end of the month lay their eggs in conspicuous elongated oval sacks of closely felted downy white threads. As the eggs pass the winter upon the old grass, the burning over of pastures and meadows late in autumn or before growth begins in spring, would be an easy way of destroying this scale, should it at any time multiply so as to become injurious.

ROOTS AND VEGETABLES.

Both field and garden roots and vegetables have been to some extent affected by weather conditions in spring, and also have suffered considerably from well known enemies, but in most places they picked up well in autumn. Foremost among insect enemies were cutworms, which were extremely abundant and destructive in some parts of the Maritime Provinces, Ontario and the North-west Territories, and also in some places in British Columbia. The Turnip Flea-beetle did a great deal of harm in Nova Scotia, making it necessary sometimes to sow twice and even three times. Turnips

in fields as well as in gardens were much injured by the ordinary Cabbage Root Maggot. The Onion Maggot was destructive everywhere. Beets and mangels had their leaves somewhat blistered by the mining larvæ of the fly *Pegomyia bicolor*, Wied., reports being received both from western Ontario and Nova Scotia; little harm, however, was done, as the attack stopped early in the season. The Turnip Aphis, Cabbage Aphis and plant-lice upon several other vegetable crops were numerous and destructive.

Potatoes were in most districts a satisfactory crop. The Colorado Potato Beetle was less aggressive than for many years, and no new enemies of prime importance were reported. The Potato Aphis occurred at Mahone Bay, in Nova Scotia, and did some harm ; but this is an insect which so far has only appeared at long intervals. The Potato Rot has been rather prevalent and destructive. In Prince Edward Island 'the root crops were good—potatoes never better nor less attacked by pests of any kind.' (Rev. A. E. Burke.) At the Provincial Exhibition held at Charlottetown in September last, the exhibit of potatoes was simply wonderful, the tubers being even in size and remarkably free of blemish. In Nova Scotia the crop was a good average one, with little mention of rot. In Ontario there was a large yield, but considerable rot appeared, especially on heavy soil or on low land; the extent of the loss is variously estimated at from 20 to 50 per cent. In British Columbia, Mr. J. R. Anderson says: 'Potatoes are decidedly under the average in those sections where the best qualities are produced; fair on low lands; prices firm. The yield of other root crops is about normal, but short in some of the higher regions, although the quality is good.'

Spraying potato fields with Bordeaux mixture to prevent injury by the Potato Rot has again shown the great value of this useful remedy. Four sprayings on August 1, 15, 31 and September 14, gave potatoes absolutely free of all traces of disease. This was on light sandy land, and, as a rule, one or two more sprayings would be advisable. The saving from this treatment for Potato Rot is now so well established and so many object lessons have been given at fall exhibitions and on the experimental farms, that it is a most remarkable thing that more farmers and others do not practise such a simple method of saving a large proportion of their crop. Although, as with every other remedy, there is a variation in the amount of protection, in every instance that has come under my notice, and these have been many since we began to spray potatoes on the experimental farms, to show farmers what an excellent remedy it is—it has been invariably shown that spraying potatoes with the Bordeaux mixture to prevent Potato Rot always pays. Every year such demonstration plots have been grown since 1891, and, besides this, the Horticulturist and Agriculturist now spray all their potatoes as an economic method of obtaining as big a crop as possible.

The Potato Scab, another fungous disease which frequently disfigures and lowers the market value of potatoes very much, was also reduced to a minimum by soaking the tubers used for seed, before sowing, in a solution of 8 ounces of commercial formalin and 15 gallons of water.

CUTWORMS.—The larvæ of several species of noctuid moths known collectively under the name of cutworms (Plate I., fig. 1), as usual, did a large amount of harm in gardens, as well as, in some instances, in fields. By far the greater part of the injury was done by the Red-backed Cutworm (*Paragrotis ochrogaster*, Gn.), which is one of the widest spread and most injurious cutworms we have in Canada, appearing every year in greater or lesser abundance. It is not always possible to determine the species which is reported upon, but in most instances mentioned below actual specimens were received:

I was informed when in Prince Edward Island recently that, in almost all parts of the Island, cutworms had been most destructive last spring. Father Burke says : 'They were never more plentiful than last year and did a great deal of damage to all crops. Your poison bran remedy seems dangerous to apply where there are birds, fowls and other domestic animals about.'

Mr. A. McNeill, Chief of the Fruit Division, Department of Agriculture, writes on July 27: 'During my last visit to Prince Edward Island, I saw in many places, particularly in Queen's County, most serious depredations by cutworms. Our July crop reports emphasize this and show that the root crops as well as garden truck have been almost completely destroyed by cutworms. I trust you will be able to think out some scheme to help farmers get rid of this enemy.'

Mr. Saxby Blair, Horticulturist at the Experimental Farm, Nappan, N.S., told me, when visiting the farm in June last, that this same cutworm had done a great deal of damage in his vegetable plots and in the flower beds. I advised him to use the poisoned bran remedy, and he now tells me that, as far as the cutworms are concerned, this was most satisfactory in checking them.

'Mahone Bay, N.S., June 28.—I send specimens of cutworms which are doing damage here. They cut off indiscriminately all kinds of vegetables. One of the specimens sent had just finished cutting off a potato stalk nearly half an inch in diameter. About ten per cent of my peas were taken, and other vegetables were injured. Some of my neighbours suffered somewhat more severely. These grubs, I notice, are becoming more common. Last year there were comparatively few, and the year before I saw none. Please tell me the species. I don't need other information as I find cutworms fully treated in your reports.'—C. A. HAMILTON.

'Tignish, N.S., June 30.—Cutworms are doing much damage in this part of Cumberland County. In my garden, with the exception of potatoes and sweet corn, they have eaten nearly everything.'—G. E. STOPFORD.

'Northport, N.S., July 6.—The cutworms I am sending are destroying cabbages, mangels, beans, &c., and are a perfect pest. What can be done to prevent their still growing more plentiful another year and to put a stop to the damage they are doing now ?'—G. BRANDER.

'Forest Glen, N.B., July 1.—I send you specimens of grubs which have given us great trouble this spring in our garden. They eat off the bean stalks just as they come above the ground. After they had destroyed a great many of our early beans they attacked black currant and gooseberry bushes.'—J. BLEAKNEY.

'Hartland, N.B., July 4.—I am very much troubled this year with insect pests. Many of my plants are being cut off by grubs, and the trouble is general in this neighbourhood. In my garden, only cauliflowers and cabbages are attacked; but, with my neighbours, beans and tomatoes are badly destroyed. One man lost half his beans. I see that you recommend mixing bran with Paris green and sweetened water, putting a little of this round the plants. Is there any possibility of the plants absorbing enough of the Paris green so placed to render them unsafe for food ?'—JOHN BARNETT.

'Batiscan Station, Que., July 8.—What can I do to destroy grubs that are eating up my onions, cabbages and other vegetables ?'—M. SISSONS.

'Trenton, Ont., November 11.—The only instance of serious loss from insect enemies during the past season, which has come under my notice, was when I was at Coe Hill about midsummer. I learned of the almost total destruction of young cabbage plants early in the season by cutworms.'—JOHN D. EVANS.

'Calgary, Alta., June 20.—We are sending herewith some cutworms which are destroying all plants they come in contact with.'—HOLE & ANDERSON.

'Blackfalds, Alta., July 8.—Cutworms are very bad here this year. They have even started to eat off stalks of the potatoes.'—E. DALTON TIPPING.

At Ottawa there was again this year a veritable plague of cutworms. My assistant, Mr. Arthur Gibson, took notes upon some fields which had been treated to save the crops from cutworms; and his observations confirmed us in the belief that the poisoned bran remedy, which I have advised so widely during the last few years, was on the whole the most satisfactory way of stopping injury by cutworms, and is a practical remedy equally applicable for crops growing in fields as in gardens. Mr. Gibson found in a field of tobacco which was being rapidly destroyed, that, by the second day after the remedy was applied, the destruction of the plants stopped entirely, and dead

Fig. 1.—A cutworm and its moth.

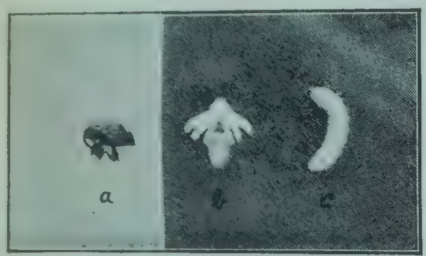


Fig. 2.—The Plum Curculio: *a*, beetle; *b*, pupa; *c*, larva—natural size.

Fig. 3.—The Plum Curculio: beetle—enlarged.

Fig. 4.—The Cottony Grass Scale: egg-sacks on grass—natural size.

(Figs. 2 and 3 kindly lent by J. M. Stedman, Columbia, Mo.; Fig. 6, by the N.H. Agr. Exp. Station.)

Fig. 5.—Apple infested by Apple Maggot.

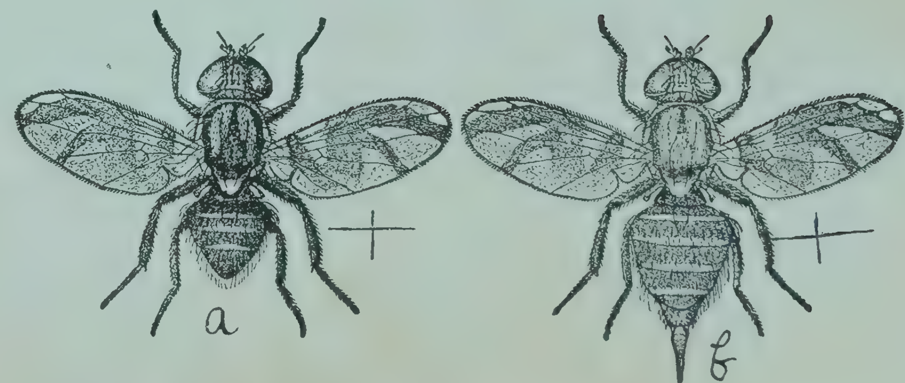


Fig. 6.—Flies of the Apple Maggot: *a*, male; *b*, female—enlarged.

or dying cutworms could be found by moving the soil lightly beneath every plant. By actual count, as many as nineteen were found under a single plant, and nearly as many under several others. This is only one instance of the very remarkable effectiveness of this remedy.

Remedy.—The poisoned bran mash is made by mixing half a pound of Paris green with fifty pounds of slightly moistened bran. In making this, it is best first to dampen some of the bran slightly with water containing a little sugar. After mixing thoroughly, add the Paris green by dusting it on the surface and stirring all the time. We have found that when Paris green is added to perfectly dry bran, owing to its weight, it will sink at once to the bottom when stirred, in the same way that it does in water. Half a pound of Paris green is enough to poison fifty pounds of bran, although double this amount may be used. If the mixture is too wet, more dry bran should be stirred in until the mixture will crumble easily and run through the fingers without adhering.

When required for garden use, all that is necessary is to sprinkle a little of the poisoned mixture by hand around such plants as are liable to attack. When crops are planted in drills or in rows, a convenient way is to make the mixture almost dry and then distribute it by means of a Planet Junior or other wheel seeder. In field practice, among such close growing crops as standing grain, which are sometimes injured by the Red-backed Cutworm, the poisoned bran remedy is also serviceable. The mixture can be distributed by means of a paddle or shingle and can be thrown easily to a distance of twenty feet. When distributed in this way, there is much less danger of chickens and birds picking it up than if it is placed in lumps.

The question of danger from the use of this poisoned bait is one which must be considered. It is frequently inquired about by correspondents, and some instances of the poisoning of poultry where it has been used, seemed to be justly attributable to their having eaten some of it. As a rule, there is little danger from this cause. The quantity used is so small that it is not noticed by poultry; and then, in gardens, poultry do so much harm to plants that they should never be admitted, at the time of year when cutworms occur injuriously and only at special times of the year when there are no crops to injure. If, however, there should be a bad infestation by cutworms and there is no means of barring out or driving away the chickens, the owner of the crops must decide whether he will lose his crop or take special means of protecting his chickens. The experience of a great many people who have used this remedy without taking any special precautions, is that injury to domestic animals is extremely rare ; and, although I have been on the watch for any trouble of this sort for many years, I do not know of a single instance when poultry have been poisoned, without doubt by eating poisoned bran put out for cutworms. However, there will be many occasions when plants in gardens may be protected by putting out the poisoned bran in small heaps and then covering these up with a piece of shingle or some other covering, so that the material cannot be got at by stray chickens and other poultry.

It has also been asked whether there is any danger of plants absorbing Paris green from this mixture when placed near their roots. In reply to this, it is only necessary to point out that Paris green is practically insoluble and therefore cannot be absorbed by the plant.

Root Maggots.—These insects, which every year are a serious tax on market gardeners, were in 1904 particularly aggressive, and from every province frequent demands were made for a practical remedy. Radishes, cauliflowers, cabbages, turnips, onions, and, in a few instances, beans and sweet corn were injured. Only a few years ago there were many districts in the West where root maggots were unknown; but of late years these have been invaded. Bad infestations are reported by Mr. N. H. Holland, from Norquay, Man., who speaks of his success in growing onions in former years, but now finds that he has this year lost a third of his crop and says that the maggots are get-

ting worse every year. Loss is also reported from Regina, Moosejaw and Calgary, a well as from many places at the coast, in British Columbia. In the Ottawa distri these maggots were particularly destructive, and on the Central Experimental Far Onion Maggots worked actively throughout the season from the middle of June ti November, when they were destroying the ripe bulbs. The Radish Maggot was abu dant in spring, and again in September. Cabbages and cauliflowers which were ke free from these enemies till the middle of July, were not afterwards injured. Th was probably due to the hardening of the stems and the abundant root growth. Bea planted late and too deep in the soil were moderately attacked, but this is an unusu injury. Only one instance of corn being injured came to my notice, and this was fro the seed having lain in the land for a long time and growth being retarded by cold w weather. Several remedies were experimented with, but no very satisfactory resul were obtained, except in the case of plants grown under a light wooden frame covere with cheese cloth, such as was mentioned in my last report. Under these protection however, radishes and cauliflowers of high quality were grown which were perfectl free from the attacks of the maggot. Onions were too much drawn up by the shad and did not bulb well. I found that a convenient covering of this nature 8 feet lon by 2 feet wide, and 2 feet high, can be made for about 25 cents, the frame being o light one-and-a-half-inch square wood simply nailed together at the corners and wit cheese cloth tacked on on the outside. In a frame of these dimensions five cauliflower and two rows of radishes were grown. The frame was kept on from the time the seed were sown until the radishes were pulled. Cauliflowers were sufficiently advanced t require no further protection, and the frames were removed about the 1st of Augus As a rule, the attack of the root maggots becomes perceptibly less by the first o August; and even late cabbages planted in July are seldom attacked by root maggot During the season of 1904, the insect in all stages could be found throughout th season.

For plants grown in the open, the best results this year were secured from th following remedies:—

For Onions.—White hellebore dusted along the rows once a week gave compara tively clean onions, very few being attacked. In years when it is necessary to appl the remedy throughout the season, this would be too expensive to be considered a pra tical remedy. The Cook carbolic wash, which is very effective for radishes, was les so with onions. Pyrethrum insect powder, Bug Death, Paris green and plaster, use as dry powders, had little effect. Sand saturated with coal oil and Jeyes' Gardener Friend, were also tried this year without any decided results in saving onions fro attack.

For Cabbages.—The remedies which have given the best results for cabbages are 1. The Goff tar paper disks, which are pieces of ordinary tarred building paper thre inches in diameter, with a slit running to the centre so as to allow of their bein placed around the stems of the young cabbages at the time of planting. 2. About hal a teacupful of a decoction of pyrethrum insect powder, four ounces to a gallon o water, poured around the roots of each plant after drawing away the earth, right dow to the rootlets. The earth should then be pushed back again and hilled up round th stem. As a substitute for pyrethrum insect powder, hellebore was tried this year, n only at the Central Experimental Farm, but also by Mr. Saxby Blair, the Horticultu ist at the Experimental Farm for the Maritime Provinces, at Nappan, N.S.. The re sults were very satisfactory. Mr. Blair writes : 'The Cabbage Root Maggot gave u considerable trouble last year; but this season their numbers were much greater an they proved very destructive to all the plots of cabbages and cauliflowers except tw These were where hellebore was used. This remedy exceeded all my expectation and no root maggots could be seen around any of the plants in these two plots; indee they were the only good cabbages out of some 1,500 set out. The powder was mixe with water and applied with a force pump; I used two ounces to the gallon and fou ounces to the gallon, and found the results of the two ounces just as good as wher

four were used. I am much pleased with this remedy, and, as far as one can judge from a single season, I am inclined to consider this a positive remedy for the root maggot of cabbages.'

Hellebore as a remedy for root magots was first recommended to me many years ago, about 1888, by Mr. S. Greenfield, a successful gardener of Ottawa East; and I have found that, as a rule, it is a useful remedy. At Ottawa this year, as in previous years of heavy infestation, it provided considerable protection, but was not as perfect a remedy as Mr. Blair found it at Nappan.

For Radishes.—The Cook carbolic wash, consisting of one quart of soft soap, or one pound of hard soap, in a gallon of water, with half a pint of crude carbolic acid added, and the whole boiled together for a few minutes, to make the stock emulsion, has proved over and over again an excellent remedy for radish maggots. The stock emulsion can be kept in a closed vessel, so that dust and rubbish will not fall into it; and, when required for use, one part of this mixture by measure is added to fifty of water, and should be sprayed directly upon the growing plants from the time they appear above the ground, once a week until ready for the table. Applications of nitrate of soda, kainit and potash whale-oil soap, all of which have been from time to time recommended, proved to be quite useless at Ottawa.

It must still be acknowledged that up to the present time we have not secured practical remedy for root maggots on onions. For radishes, which are ready to pull from five to six weeks from the time the seed is sown, the question of protecting them is much simpler than in the case of onions, which are growing throughout the season. The maggots of the first brood are nearly full grown and very destructive about the end of June ; and, in some years, if the plants can be protected from injury up to that time, they are as a rule safe for the rest of the season.

There are some features about this attack which make it of interest to the entomologist. Some experiments have seemed to indicate the great value of a certain remedy, and then under other conditions this same remedy has proved comparatively useless.

For next year extensive experiments have been planned, and special attention will be given to this matter, which is one of great importance, both to the professional and amateur gardener from one end of the country to the other. From the limited experience we have had with the cheese-cloth coverings, I have no hesitation in recommending these to amateur gardeners, however small their gardens may be, as a sure means of obtaining perfectly clean, as well as early, radishes and cauliflowers of the very best quality, at a comparatively light expense.

THE GREEN BLISTER BEETLE (*Cantharis cyanipennis*, Say).—Several kinds of blister beetles occasionally attack cultivated crops, and, unless driven off or poisoned, do much harm in an incredibly short time. Although in the larval state they are predaceous parasites feeding on the eggs of locusts, in the perfect condition they feed voraciously on vegetation. The Green Blister Beetle has not been previously sent in as a crop pest, but on June 15 last Mr. Richard Coates wrote from Cowley, Alta.:—'Enclosed you will find some insects which have come in numbers to my garden this year. They stay right with the beans and peas and soon destroy them.'

These beetles are long narrow insects, sometimes nearly an inch in length, of a most beautiful deep blue-green colour, which alight in large numbers and then may be noticed crawling quickly over the plants they are attacking and rapidly devouring the foliage. I have collected this species on the wild American vetch, at several places in western Assiniboia and southern Alberta.

CABBAGE AND TURNIP APHIS (*Aphis brassicæ*, L.).—Reports of injury by this plant-louse have again this year been received from many and very distant localities. On the whole, however, I do not think it has been quite as destructive as usual.

'Victoria, B.C., November 1.—Aphides of various kinds were in evidence. Swe ish turnips and cabbages suffered severely from their ravages.'—J. R. Anderson.

'Cowley, Alta., October 19.—My vegetable garden is covered this year with a gra ish-green insect, something like the green fly that attacks house plants. They beg on the turnip tops, but now the Brussels sprouts are so covered that I cannot use the and I can only use the large heads of cabbage which are too firm for them to get i side the leaves. Most of the cauliflowers were unfit for use from the same cause.'— W. Godsal.

'Depot Harbor, Ont., September 12.—I send you samples of insects which a destroying my turnips and cabbages. What are they and what is the cure?'—J. Pratt.

Other Ontario occurrences which came to my notice were of fields moderately i fested at Whitby and at Ottawa. There were a few reports from Quebec and fro Prince Edward Island, and one from Mahone Bay, N.S.

The remedies are to watch for the beginning of the infestation when hoeing tu nips and cabbages, and destroy the colonies either by spraying with kerosene emulsi or whale-oil soap, and the destruction or deep ploughing down of all turnip tops refuse of cabbage beds in autumn, so as to destroy the eggs.

Although parasites are generally present in considerable numbers, they have n as a rule, controlled this species so completely as is the case with many others. O the Ottawa fields, specimens of a parasite were present, which has been kindly ide tified by Dr. Ashmead, through Dr. Howard, as *Lipolexis (Aphidius) rapæ*, Curti Dr. Howard says:—'This is a European species evidently introduced. We have also from Michigan.'

Plant-lice of various kinds were complained of on many kinds of vegetables a root crops during the past season. Dr. C. A. Hamilton, of Mahone Bay, N.S., h favoured me with some interesting notes which he has made from time to time in h locality during the past summer.

Potato Aphis (*Nectarophora solanifolii*, Ashm.).—Potatoes are not often troubl with plant-lice in Canada; but at long intervals outbreaks have been observed on t crop, and such a one occurred last summer at Mahone Bay, which was closely watch by Dr. Hamilton.

'Mahone Bay, June 28.—I send you some aphides from potatoes. These are a parently the same species as is now on my salsify and are abundant enough to hav appreciably blighted my potato plants.'

'July 10.—There seem to be aphides on almost everything this summer, probab because of the abnormally dry season. Besides those sent, I noticed them to-day o squashes, cucumbers, broad beans, turnips, cabbages, beets and carrots, in fact, o almost everything I looked at.'

'July 14.—The aphis on my potatoes has overrun the whole patch, with the resu that the potatoes have stopped growing and look very unhealthy. The blossoms hav withered up and fallen, the lower leaves have turned yellow, and many others hav turned black, just as if smitten with the blight, and are falling. They occur in im mense numbers. Their favourite position is upon the peduncles of the flowers, whic they cover completely. They are also found in large clusters on the stems and upo the under surface of the leaves. In many colonies there are a few flesh-coloured in dividuals.

'July 15.—In *re* potato aphis, I to-day examined several plots near the villag and found one field with about half the plants which had blossoms fairly well covere with aphis; other plants also had a few.

'July 16.—The plant-lice on the potatoes are fast diminishing in numbers; bu they have left the crop in a sorry condition.'

'August 1.—I send you to-day a last specimen from my potato plot. They hav evidently been killed by a fungus. I first noticed its effects about a week ago on on

corner, and it has since spread over the whole piece. Very few aphides are left alive. Since I last wrote, I noticed larvæ of lady-bird beetles and of *Syrphus* flies; but neither of these nor anything else had much effect in reducing the numbers of the plant-lice until this disease appeared. A month ago my potatoes could not have looked more promising. To-day I tried them, and out of six average hills I got 17 tubers, of which two only were large enough to be marketed.'—C. A. HAMILTON.

Remedy.—Should this plant-louse again appear in large numbers, infested plants may be freed of them by spraying either with whale-oil soap solution, one pound to six gallons of water, or kerosene emulsion, one to nine. These remedies would also be effective against the Colorado Potato Beetle, the Four-lined Plant Bug, Leaf-hoppers, and probably all other insect pests likely to be found on potatoes. They would not, however, probably be of any use against the Potato Rot fungus for which the Bordeaux mixture is such a useful remedy.

Aphis on celery, carrots and parsnips (*Siphocoryne*, sp.).—Dr. Hamilton sent also some aphides which he had found on celery, carrots and parsnips. It is probable that there were only two species concerned, and that both of these occurred on celery. Plant-lice are very difficult insects to send alive by mail, and, when put in alcohol or other preservative fluids, they lose their colour so much that they are not very suitable for study unless the species is well known. I am sorry to say that, notwithstanding much trouble taken by Dr. Hamilton in sending them, the specimens did not arrive in very good condition. They were, however, referred to Dr. Howard, Chief of the United States Bureau of Entomology, who reports under date July 17: 'Mr. Pergande has examined your aphides and says that 1 and 2 are species of *Siphocoryne*, apparently undescribed. The specimens on potato and salsify were rotten, but they appear to be *Nectarophora solanifolii*.'* The two species of *Siphocoryne* referred to above were very different in appearance, and there seems to be little doubt that they are different species. The specific description of these, however, will have to be postponed until further material is available. I shall be obliged to any of my correspondents who may at any time find plant-lice on carrots, parsnips or celery, if they will forward them to me for study.

Injury to celery and parsnips by plant-lice I have never seen before; but the attack on carrots has come to my notice on two or three occasions previously, and has been one of considerable importance.

'Mahone Bay, June 28.—I send aphides from my celery, some have wings and some are without; but, as I always find them together, I take them to be the same species. The small wingless ones are extremely active, disappearing at a touch to the plant. This is the first time I have seen plant-lice on celery in the three years I have been raising that crop. Eight or ten days after I set out the young plants I found them swarming with these insects, and my neighbour's plants are the same. What I think are the same kind of plant-louse, I find also on near-by weeds, *Chenopodium album* and *Galeopsis tetrahit*. I had some carbolic acid and soap wash made up for root maggots. I gave them two sprayings with this and it cleared them out.'

'July 8.—I send a number of aphides with a few celery leaves, which I hope will reach you alive or at least in good condition for examination. It is very difficult to capture these, but by touching the plants with a piece of cotton batting they jump into it and become entangled. The specimens you ask for are in bottle No. 1. Bottle No. 2 contains another kind, I suppose, which are found rather sparsely on the under-side of the leaf. In one of my letters I said that I thought that these insects had been brought here from Halifax on plants obtained by a neighbour. I do not think this now, as I find them infesting the celery of another neighbour who raised his plants from seed and who lives over half a mile from either of us. When first noticed, the insects were very plentiful, the celery was only an inch or an inch and a half high,

*Dr. Ashmead's description of this aphis is to be found in 'Canadian Entomologist', vol. XIV., 1882, p. 92

but each leaflet bore from six to ten aphides. They were scattered promiscuously over the plant, not clustered in any way. I sprayed my celery three times at intervals of a few days with the carbolic wash mentioned on page 182 of your 1903 report, with the result that the insects disappeared entirely each time for a day or two, then reappeared, but in diminished numbers. Close observation to-day shows me that these plant-lice are on the celery bed, on the soil and plants of an adjacent salsify bed, one foot away, as well as a few upon beds of carrots; and they appear to be feeding on both of these latter plants. I cannot see that they have injured my celery very much, whatever they might have done, had they been left unchecked; still, they undoubtedly are feeding upon it, and perhaps the injury does not show, because the ground is very rich and the plants are well cared for. No. 2, however, whenever present, distorts the leaves, and, if present in larger numbers, would, I think, be very injurious.'

'July 10.—Aphides from Salsify : These are increasing very fast, and my plants are getting overrun, but you will notice that some of them are parasitized, having died and turned white. They are bound down to the leaf with a webby material which covers a small grub.'

'July 14.—Whitish fragments of dead aphides lying in abundance upon my carrot leaves and upon the ground beneath called my attention to them, and I found the new leaves had their petioles swarming with plant-lice. Although very plentiful, they do not yet seem to have done much harm. I find a few species of lady-bird beetles and some other predaceous parasites, of which I send you specimens. I have been more anxious for you to see these insects, because on looking over your reports I find no reference to either a potato or a carrot aphis.'

'July 15.—I find to-day that my parsnips are also infested by aphis. Please notice if these are not the same species as those on carrot; and those on potato look very much to me like those I sent you some time ago, which were found on salsify.'

'July 16.—The dark hopping aphis on celery has disappeared; but I send you more of the green ones from the underside of the leaves, with as many winged specimens as I can find. They have not been very plentiful on the celery, but seem to me very much like those from the carrots and parsnips. I find lady-bird larvæ very plentiful on my carrots to-day, and they are clearing off the aphides nicely. I have been much interested in watching these pests, and shall be obliged if you can send me the names of them : two from celery, one from parsnips, one from carrots, salsify, cabbage and potatoes.'—C. A. Hamilton.

'Antigonish, N.S., Sept. 7.—My celery has been infested by a green bug. I inclose specimens and should like to know what it is and how to get rid of it.'—F. H. Beals.

As stated above, there is still some doubt as to the exact identity of the species found on celery, carrots and parsnips. I shall, therefore, be glad to get specimens for further study.

The Red Turnip Beetle *(Entomoscelis adonidis,* Fab.).—In travelling through Manitoba and the North-west Territories in July last, I saw very few specimens of this beetle, which is sometimes a rather serious pest of cruciferous crops in the West; but some inquiries have been sent in as to its nature and habits.

'Edmonton, August 21.—Some gardens here are infested with a beetle somewhat like a lady-bird but bigger, which is bright red with black bars down its back and a spot on the collar, about three-eighths of an inch long by a quarter of an inch wide. This is doing some harm to radishes and turnips. In addition to this, some of the white turnips are terribly diseased this year.'—C. H. Stuart-Wade.

The same insect was written about from St. Lazare, Man., by Mr. Louis Worms, who says that the insect had appeared in his district, and had been the cause of a good deal of discussion among farmers as to whether or not it was the Colorado Potato Beetle. He speaks of the leaves of turnips being entirely eaten or cut up into rags, and also that a large number of the turnips had rotted.

Mr. Norman Criddle reports that 'The Red Turnip Beetle became rather troublesome last summer to cabbage, radishes, turnips and a few other garden plants. I noticed, too, that it had a preference for radishes in the seedling state. A few of these plants left to go to seed would, I think, make excellent traps for the beetles, and could be sprayed from time to time to destroy those which have gathered there.'

The PURPLE-BACKED CABBAGE WORM [*Evergestis (Pionea) straminalis*, Hbn.].—Occasional reports have been received at different times during the past ten years of the presence of short bristly caterpillars attacking cabbages and turnips in the Maritime Provinces. This injury was for the most part to turnips, and was generally noticed late in the season, the caterpillars congregating on the crowns of the turnips and eating cavities into the roots, as well as consuming the leaves. During the past season this caterpillar seems again to have been somewhat abundant, particularly on Cape Breton Island, whence Mr. E. J. Williams, of Little Bras d'Or, sent specimens, together with notes on the occurrence. He also reports that in some years whole fields of cabbage and turnips have been destroyed by these caterpillars. Among the specimens sent by Mr. Williams were a large number of half-grown larvæ of the Spotted Cutworm (*Noctua c-nigrum*, L.), which undoubtedly had been responsible for some of the injury described by him in the following note. Writing under date of October 24, he says:—'I am sending you some of the caterpillars I spoke of. They are very gregarious in their habits; they start under the leaves right on the ground but mine their way up to the head, tunnelling it hollow.'

In 1903 Mr. C. H. Young, of Ottawa, made some observations on injuries by this species upon cabbages near Old Chelsea, Quebec, twelve miles from Ottawa. The caterpillars, however, were not very numerous in this instance, and were not noticed to bore into the stems as mentioned above, but lay exposed on the leaves, and only two or three caterpillars were found on a single plant. Full-grown larvæ collected by Mr. Young on July 11 produced moths on August 8.

There is little reference to this species in the literature on injurious insects; but under the name of *Pionea eunusalis*, Walk., there is an account, with a good figure of the larva, by Thaddeus Harris in his Entomological Correspondence, page 322, stating that on October 30 and November 1, 1841, he had found larvæ on the leaves of horseradish. He thus describes the attack: 'They eat large holes out of leaves, leaving finally only the veins untouched. They live beneath the leaves, stretched out by the sides of the midrib. They creep regularly, not haltingly, and move pretty fast. When alarmed or disturbed, they curl quickly and loose their hold and fall to the ground. Found the same on turnip leaves, October 20, 1844. Their ravages were considerable.'

The Purple-backed Cabbage Worm is closely related to the Cabbage Pionea (*Evergestis rimosalis*, Gn.), which is a well known pest of the cabbage and turnip. That species, however, does not occur injuriously in Canada. The following is a description of the caterpillar, and is made from the specimens sent by Mr. Williams:—

Body tapering slightly to each end; length, three-quarters of an inch by one-eighth at the widest part; head, a shield divided into two spots on the second segment, and a small plate at the end of the body, black. The general colour of the back, purple with a brownish tinge, the lower part of the body, pale greenish. The body is marked with the ordinary bristle-bearing tubercles and a rather conspicuous yellow band on each side, where the breathing pores are placed. The six tubercles above the side lines are rather more conspicuous than those below the lines and are of a deeper black. The tubercles are all black, but have white marks at their bases, which form a part of an indistinct network of lines over the whole upper part of the body. These lines are broken up into dots, or seem to be narrow, broken, thread-like longitudinal lines connecting the tubercles in each series. There is also an equally indistinct line which runs transversely across the middle of each segment, and one in each intersegmental fold, the whole forming an open network composed of two series of very indistinct but perceptible lines running at right angles to each other. The chief character by

which this caterpillar will be recognized from that of the Cabbage Pionea, is that its head is shining black, while that of the last named is yellowish.

The moth of the Purple-backed Cabbage Worm is a very neat little species, which expands seven-eighths of an inch. The upper wings are of a strawy yellow with a satiny lustre, and are marked rather distinctly with a heart-shaped discal spot, two distinct transverse waved lines across the centre of the wing, the inner of which runs through the middle of the heart-shaped spot, and two less distinct lines, one at the base and the other close to the apex. There is also a conspicuous dark blotch bearing a white crescent outwardly, towards the apex of the wing. The spaces between the transverse lines, especially on the nervures, are powdered sparsely with brown scales. The lower wings are silvery white, with a clear, broad black margin and a narrow submarginal line inside this. The fringes of the upper wings gray, of secondaries white.

The full life history of this insect is not yet known; but it passes the winter as a chrysalis in a closely woven cocoon, to the outside of which many particles of earth are attached. The moth emerges in the spring, and there are probably two or three broods in the season.

FRUIT CROPS.

The conditions affecting the value of fruit crops in Canada during the past season are peculiar. The apple crop has not been particularly large in most districts, but was of exceptionally good quality. Early apples were abundant, but the markets were poor and 'thousands of bushels of fall apples remained unpicked or were fed to live stock.'—(Ont. Crop Rep., Nov., 1904.) Winter apples were rather short in quantity and, notwithstanding the quality, the present prices are low, owing to the enormous crop of high quality apples in Europe, which discouraged shipments and kept the fruit in our own markets, glutting them and holding down prices. There was an unusually poor plum crop almost everywhere, except in British Columbia, where it is reported 'plums and cherries were up to the average; large quantities were sent to the North-west, and good average returns were realized. Small fruits also gave our growers good returns this year; raspberries were a fair crop, blackberries good, strawberries yielded well, and those shipped to the North-west and Manitoba arrived in excellent condition.'—J. R. ANDERSON.

The excessive cold of last winter seems to have affected somewhat nearly all of our fruit crops this year. Apples are everywhere reported as rather small in size. Many varieties were severely killed back on the young wood. The same thing, and to a greater degree, is reported of pears; and this fruit was also injured by drought in British Columbia, and Black Spot and Fruit Crack in Ontario. Strawberry plants nearly everywhere suffered from winter-killing. The heaviest loss to fruit-growers from the winter was in the great destruction of the peach orchards in western Ontario, and in the orchards of Northern Spys and Baldwins throughout the country. Grapes were a fair crop, but where not sprayed, were considerably injured by Black Rot (*Læstadia Bidwelli,* V. & R.), the Brown Rot (*Peronospora viticola,* De Bary), and mildew.

Injurious insects were fortunately not very aggressive in 1904. There was, of course, as is always the case, a certain amount of damage done by the regularly occurring pests of the orchard, such as Tent Caterpillars, Cankerworms, the Eye-Spotted Bud-moth, the Oyster-shell Scale, the Cherry Slug, the Imported Currant Sawfly, &c., for which standard remedies are available to all who wish to use them. These insects give no trouble in any properly looked after orchard, where the work is done syste-

matically at the proper time and with due regard to the true value of each operation, where regular cultivation and spraying are done as a matter of course, and not as an exceptional expedient which some unusual occurrence has made necessary.

Mr. A. McNeill, Chief of the Fruit Division of the Commissioner of Agriculture's Branch of the Department of Agriculture, has kindly allowed me to examine the reports from his correspondents all over the Dominion; and in this way I have been able to learn many useful facts concerning the condition of fruit crops and the insect and fungous enemies which have affected them during the year. Mr. McNeill writes as follows:—'Our crop reports this year furnished us with a large amount of material bearing upon fungous diseases and insects. On the whole, it may be said that these enemies did not do as much harm as usual. There were, however, several sections where the Apple Scab (Black Spot, *Fusicladium*) was particularly bad. One of these was the western peninsula of Ontario, where it was difficult to secure any clean fruit except in well sprayed orchards. A curious condition prevailed in the Annapolis and Cornwallis valleys of Nova Scotia. One part of the valley was particularly free from fungous diseases, while in another these were decidedly prevalent. There were no serious attacks of insects, and indeed the year 1904 may be said to have been remarkable for the absence of injury by the Codling Moth. This exemption, however, must not be counted on for the future, inasmuch as there were still sufficient insects to propagate the species; and, with favourable conditions, there is no reason why the Codling Moth should not be prevalent again next year.'

Mr. J. R. Anderson writes :—'Victoria, B.C., Nov. 1.—Apples were good, but the yield was only average. Prices ruled high, and those growers who put their product on the market in good shape realized well. Fruit-growing is receiving much greater attention, as it is better realized that, with that care which is due to every branch of agriculture, a very superior article can be produced, with a corresponding profit to the grower. An exhibit sent to England from British Columbia was awarded the highest gold medal of the Royal Horticultural Society. This alone has stimulated the planting of orchards to an unprecedented extent.'

'Wolfville, N.S.—We have been singularly free from injurious insects this year ; but Cankerworms and Tent Caterpillars are both on the increase, and there has been some loss from Eye-spotted Bud-mouth and Cigar Case-bearer, the latter of which is especially common in Annapolis County.'—F. C. SEARS, *Horticulturist, Department of Agriculture, Nova Scotia.*

'Alberton, P.E.I.—Our apple crop is large and cleaner than for many years, even in unsprayed plantations. The Black Knot on plums and cherries, wild and domestic, was bad.'—Rev. A. E. BURKE.

The following occurrences of insects injurious to fruit crops, among others, have been brought to my notice during the season and have received attention from the officers of the Division.

The SAN JOSÉ SCALE (*Aspidiotus perniciosus,* Cmstk.).—It is satisfactory to be able again to report that no new infestations by this insect have been reported beyond the limits of the area already invaded in 1903. It is probable that during the severe winter of 1903-1904 a large proportion of the wintering scale insects was destroyed. Among reports received, the following is of considerable interest, as coming from one who is specially able to observe and draw correct conclusions. Mr. Geo. E. Fisher, of Freeman, Ont., writes on July 10 last as follows :—

'The past winter was so unusually severe that I have been much interested in examining the condition of the San José Scale, to learn if possible the effect of extreme cold on this insect. Mr. Davis, of this place, for the past two years, has prepared about 100 barrels of lime and sulphur wash each year, which has been used by the fruit-growers in the district with such good effect that there is really little opportunity for investigation. However, I found a spot where the scale had been for some time, and had not been treated. I made weekly visits to this orchard, beginning about the

middle of June. At that time most of the scale insects appeared to be dead, and, as I had found in my experiments, that the males were more easily killed by treating with various mixtures than the females, I hoped that the winter might have destroyed the males, and that there might be no breeding. The cold weather certainly reduced the scale very much indeed, only a small proportion being alive, and these developed slowly; but I find that some have reached maturity, and at the present time trees which last fall had a lot of live scale upon them, have larvæ in moderate quantity running on the twigs, some with new white cover scales just formed, and some which have reached the drab-coloured state. From what I saw in this orchard, I take it that breeding began about July 5 this year, or two weeks later than usual.'

Although the San José Scale has not spread beyond its former limits, there is still a heavy and destructive presence of this insect in the orchards within the infested area. As misstatements with regard to this matter have frequently appeared in newspapers and elsewhere, it may be well to again repeat that the only part of Canada where the San José Scale is found is in the Niagara Peninsula and in the counties along the north shore of the western end of Lake Erie. Every care is being exercised by the Honourable the Minister of Agriculture to prevent any fresh importation from outside countries. The fumigation stations at Vancouver, B.C., Winnipeg, Man., Windsor and Niagara Falls, Ont., St. John's, Que., and St. John, N.B., are kept open in charge of competent men, who unpack, fumigate with hydrocyanic acid gas, and promptly repack and send on, all nursery stock which comes into the country. The fumigation with hydrocyaic acid gas, of the strength and for the time the trees are submitted to it in the government stations, is perfectly certain to kill every scale insect upon them.

A rigorous watch has been kept on every kind of nursery stock which could possibly bring in fresh importations of the San José Scale; and I have again this year the greatest satisfaction in reporting that no single instance has been brought to my notice of living scales having been detected on trees which had passed through the fumigating houses. The superintendents at all of the stations have done their work carefully and well, and no well-founded complaints have been received from importers, either as to the slight delay which must occur while the stock is being treated, or as to any injury to the trees during the necessary unpacking, handling and repacking. Careful experiments have shown that the formula used at our federal fumigation stations is thoroughly effective in killing the San José Scale, and does not in any way injure the stock submitted to the gas. The formula used is one ounce of cyanide of potassium (98 per cent), one ounce of commercial sulphuric acid (66° Baumé), and three ounces of water—exposure, 45 minutes.

In addition to the above, the provincial government of Ontario have strictly enforced an Act compelling nurserymen to fumigate every shrub and tree sent out by them from their nurseries, whether the San José Scale had been found in their nurseries or not. These firms have, wisely, acted well up to the letter of the law, and, while complying with the provisions of the Act, by sending out only first-class stock, have sustained their business reputation in the best way possible.

The federal fumigation houses are kept open, with a superintendent constantly in attendance throughout the seasons of spring and autumn shipments of stock. The fumigation seasons for the various stations are as follows:—

Vancouver, B.C.—October 15 till May 1.
Winnipeg, Man.—March 15 till May 15, and October 7 till December 7.
Windsor, Ont.—March 15 till May 15, and September 26 till December 7.
Niagara Falls, Ont.—March 15 till May 15, and September 26 till December 7.
St. John's, Que.—March 15 till May 15, and September 26 till December 7.
St. John, N.B.—March 15 till May 15, and October 7 till December 7.

The San José Scale Act and the amendments which have from time to time been made, are the result of an effort on the part of the Honourable the Minister of Agri-

culture to help the fruit-growers of the Dominion by allowing them to import nursery stock of such new kinds of fruits as from time to time are originated outside of Canada, and which it is claimed by fruit-growers are necessary for the profitable prosecution of their business, but at the same time, to safeguard their interests in every possible way by taking such precautions as would make it practically impossible for any new infestation of the San José Scale to be brought into the country with the nursery stock. The whole expense of the different stations is assumed by the Dominion Government; but all shipments are made entirely at the risk of the shippers or consignees, the government assuming no risk whatever. The packages must be addressed by the shippers so as to enter Canada at one of the above-named ports of entry, and the route by which they are to be shipped must be clearly stated upon each package.

Many horticulturists and nurserymen have availed themselves largely of this concession, and at every point much stock has been imported from the United States and Japan. Nursery stock of all kinds can be imported from Europe without fumigation, as the San José Scale has never gained a foothold in European countries. Certain other plants which are not liable to the attack of the San José Scale are also exempted from treatment under the San José Scale Act. These are: (1) greenhouse plants, including roses in leaf which have been propagated under glass; (2) herbaceous perennials, including strawberry plants; (3) herbaceous bedding plants; (4) all conifers; (5) bulbs and tubers; (6) cottonwood (*Populus monilifera*), grown in Minnesota and the Dakotas.

Remedy.—Frequent inquiries are made as to whether there is a practical remedy for the San José Scale. I believe that it may now be justly claimed that the lime and sulphur wash made by any of the recognized formulæ is a reliable remedy for this insect. Orchards which have been carefully treated, are in better condition than they were at this time last year, and have borne during the past summer satisfactory and profitable crops of fruit. No remedy, however perfect it may be, will give good results unless great care is taken in applying it; and even with the lime and sulphur wash, it is not claimed that a single application will always give perfect results. Any remedy which does not cost too much for labour and materials, and which will ensure a paying crop, is certainly a practical remedy. All remedies will vary in the degree to which they secure the ends aimed at, and all that is claimed for the lime and sulphur wash for the San José Scale, is that up to the present, all things considered, this has proved the best remedy, and is, at any rate, as successful in its results as any known remedy which is used in medicine for controlling the diseases of animals or human beings. Success with any remedial treatment will necessarily always depend on the thoroughness with which it is carried out.

The making of the Lime and Sulphur wash is described with full details in my last report.

The Canadian wash is made by mixing lime and sulphur together in the proportion of twice as much lime as sulphur, and boiling these together in an iron kettle for two hours (or not less than one hour). The quantity of water added to make up the required amount of wash is largely a matter of convenience in using. When boiled with steam, barrels may be used, and to begin with, should be one-quarter filled with water and the steam turned on until the water is boiling; then turn off the steam and put in the lime and sulphur together as quickly as this can be done without making the mixture boil over. When the lime is all slaked, turn on the steam again, and leave the mixture boiling for at least an hour. In Mr. Geo. E. Fisher's outfit, which has been frequently described and has been figured more than once, eight barrels of wash were cooked at once, and he found that with steam at 80 or 90 lbs. pressure, the quarter barrels of water, before the lime and sulphur were turned in, could be brought to a boil in five minutes. Mr. Fisher secured the best results when each gallon of the wash contained one pound of lime and half a pound of sulphur.

The Oregon wash consists of lime 15 pounds, sulphur 15 pounds, blue vitriol 1½ pounds. Dissolve the lime and sulphur by boiling for one hour, then add the blue

vitriol dissolved in hot water, and boil for fifteen minutes longer; fill up to 50 imperial gallons.

The California wash consists of lime 15 pounds, sulphur 15 pounds, salt 15 pounds, water 50 imperial gallons.

The Lime-Sulphur-Soda wash consists of lime 40 pounds, sulphur 20 pounds, caustic soda 5 pounds. In making, the 40 pounds of lime is placed in a barrel, and only enough water is added to make it boil rapidly. While slaking, 20 pounds ground sulphur, which has been made into a thin paste, is stirred in thoroughly; the five pounds of caustic soda dissolved in hot water is then poured in, with more water as needed, and the whole is kept stirred thoroughly all the time. As soon as all chemical action ceases, as shown by the absence of bubbling in the mixture, add hot water up to 60 gallons, and the wash is ready for use. The whole time necessary is twenty minutes.

Dr. E. P. Felt, the State Entomologist of New York State, has made a further modification in this formula, by which he substitutes ordinary washing soda for caustic soda and has secured equally good results.

In all of the above mixtures, it is best to use hot water, and to have the sulphur powdered so as to help the rapid combination of the constituents.

The lime and sulphur mixtures must only be used as winter washes while the trees are dormant, or the trees will be injured. The best time is late in spring, just before the buds expand. If necessary, they may be followed in summer by applications of whale-oil soap solution, one pound to six gallons of water, or kerosene emulsion in the dilution of one part in nine of water.

PLUM APHIS (*Aphis prunifolii*, Fitch).—The Plum Aphis was found rather abundantly on plum trees in Prince Edward Island, and Mr. Saxby Blair found it also troublesome in the orchards at Nappan, N.S. He writes: 'The pests that have worried me most are the plum and apple aphides. They are perfect nuisances. I thought I had them all controlled this year by early spraying, twice with whale-oil soap, one to six, but later on they appeared in myriads on some of the trees. It seems almost impossible to get men to spray their trees thoroughly enough to get at all of the plant-lice. Any information you can give about Plum Aphis will be useful to our fruit-growers; for this insect is becoming a general pest. Another thing is this: you advise whale-oil soap; now the average farmer in this country cannot get whale-oil soap. I tried to get some in this locality last summer, and they wanted 20 cents a pound for what they called whale-oil soap. If you can give in your report definite information where this soap can be procured, and what the usual price is, it would help. Could you not give instructions by which it could be made by the farmers themselves? I must say I find the whale-oil soap much easier and more convenient to use than bothering with tobacco water. Tobacco stems in most places are very difficult to get; but if whale-oil soap is just as good and can be got easily, that is what the average man will use. I find, too, that it takes much more liquid to do thorough work with tobacco wash than with a strong solution of soap.'

Remedies.—The standard remedies for plant-lice are soap washes and kerosene emulsion. Strange as it may seem, dark-coloured species of plant-lice certainly require stronger applications than the green kinds.

Kerosene emulsion in the dilution of one part to six of the stock emulsion has given good results against all kinds of aphides.

Soaps.—The most effective soap wash is made with whale-oil soap, one pound to from four to six gallons of water. The term whale-oil soap is merely a trade name for a fish oil soap, made with either potash or soda. The potash soaps, which are the best, because even strong solutions remain liquid when they cool, are soft soaps. The soda soaps are hard. Of the two the potash soaps are considered the best to use on vegetation, and they are more convenient to use. Both kinds should always be dissolved in hot water.

When bought at retail prices these soaps cost from 15 to 20 cents per pound, according to the locality, but, if obtained in large quantities, can be got at from 3 to 5 cents per pound. Fifty pound kegs are supplied at 5 cents per pound. Two well known brands of potash soft soaps which have been much used in Canada and have given good satisfaction, are those made by W. H. Owen, of Port Clinton, Ohio, and by Good & Co., of Philadelphia, Pa. If thought desirable, these soaps can be made at home; but it is very unpleasant and dirty work, and it is besides doubtful whether such good or cheap results can be secured as by buying from firms which make a special business of manufacturing soaps with only the required amount of moisture and the proper grade and amount of potash. It has been found in experiments carried on at Washington that what is required for spraying purposes is a caustic potash and fish oil soap, made with a fairly good quality of fish oil and from which water has been eliminated by boiling, so that it does not exceed 25 or 30 per cent of the weight of the soap. Soaps made with caustic soda instead of caustic potash are unsuitable for spraying purposes. Dr. J. B. Smith, in his circular No. 5, 'Whale Oil Soap and its Uses,' says: 'Whale oil or fish oil soap is one of the most reliable materials for use against plant-lice, and generally against sucking insects which can be killed by contact insecticides. It kills by clogging the spiracles or breathing pores of the insects and also to some extent by its corrosive action. The advantages of fish oil over ordinary laundry soap lie in the greater penetrating power, in the fact that it remains liquid when cold at much greater strengths, and that fish oil itself seems to be more fatal to insect life than other animal fats. A good soap can be made as follows:—

Concentrated potash lye	3½ lbs.
Water	7½ gallons.
Fish oil	1 gallon.

Dissolve the lye in boiling water, and to the boiling solution add the fish oil; continue to boil for two hours, and then allow to cool. Any grade of fish oil will answer.'

The PLUM CURCULIO *(Conotrachelus nenuphar,* Herbst.).—The Plum Curculio made serious inroads into the sparse crop of plums of 1904. It was complained of in all localities east of and including Ontario, and was perhaps the fruit pest most mentioned by correspondents. Plums, apricots, cherries and apples were injured.

The injury of the Plum Curculio is known by sight by thousands of fruit-growers who have never seen the beetle to recognize it as the cause of the injury which they know so well on their fruit. The beetle itself (Plate I., figs. 2*a* and 3) is less than one-fourth of an inch in length, brown and rough, with black and gray mottlings, which give it a remarkable resemblance to a small piece of bark, and make it very difficult to distinguish. There is only one brood of this insect in the year; but perfect insects may be found at all times, because the beetles which emerge during August or September of one year, pass the winter as perfect insects under dead leaves, &c., and feed on the buds and leaves of plum trees early in the spring, and later during the season on leaves and fruit of various kinds; the old insects of the year before may often be collected at the same time as the newly emerged brood. When plums are about as large as pease, the crescent-shaped slit, with a small flap containing the egg, may be seen upon them. The egg hatches soon after, and the white grub (Plate I., fig. 2*c*) bores into the fruit, so that in the case of the plums they soon fall from the tree. The peach, apricot, cherry, apples and pears are also injured, but do not fall from the trees to nearly the same extent as plums. A great many more of the larvæ of the Plum Curculio come to full growth in plums than in the other fruits ; the rotting of the fruit seems to be necessary for these grubs to mature. There is no doubt that by far a larger number of the grubs become beetles when they have fed in plums and cherries than in any other fruit. In apples, to which it causes serious injury also, from the disfiguring of the fruit, very few larvæ mature. By midsummer the larvæ are full grown and burrow a short distance into the ground, where they turn to pupæ, and the adult beetles emerge in August.

Apples badly disfigured were sent by Mr. C. L. Stephens, from Orillia, Ont., and similar samples were also received from two or three localities in Quebec province.

Remedies.—The remedies for the Plum Curculio are as follows : (1.) Spraying the trees early in the season so as to destroy the beetles which for some time feed upon the buds and opening leaves of plum trees. The second spraying, with poisoned Bordeaux mixture, should be made when the plums are about as large as pease. This will coat the young fruit so that the beetles are destroyed when they feed on the fruit or cut the crescents for egg laying. (2.) The destruction of all windfalls or injured fruit that drops, so as to clear away all fruit before the larvæ emerge and enter the ground to pupate. Poultry, pigs and sheep help well in this work. (3) The ploughing up and cultivation of orchards so as to remove grass and other vegetation which, besides weakening the trees, gives places for the insects to hide in. The depth at which the larvæ pupate is about an inch beneath the surface, and the pupation in this part of Canada takes place during July ; therefore cultivation during that month will destroy many of the pupæ, and this has been found the remedy which has given the best results in old orchards which had been in sod for many years and in which the fruit had been seriously injured year after year. (4.) The jarring of plum trees, which is much written about and highly recommended, will certainly destroy many of the beetles, but costs too much for labour when compared with spraying with insecticides, which give more certain results in my experience. As the plum and peach are rather easily injured by some arsenical poisons, arsenate of lead, 1 lb. to 50 gallons, is preferable to Paris green for these trees.

The Apple Maggot (*Trypeta pomonella,* Walsh).—The Apple Maggot has never done much harm in Canada, although its injuries are very serious in the apple orchards of Main and some other States adjoining our borders. The slender white maggots, about a quarter of an inch in length, burrow in all directions through the flesh of attacked apples, feeding upon the pulp and leaving discoloured channels (Plate I., fig. 5). There are sometimes as many as a dozen maggots in a single apple, but even one is sufficient to render it worthless. The eggs are inserted beneath the skin of the fruit by beautifully marked black and white flies, with shining greenish golden eyes. The general appearance of the fly is shown in Plate I., fig. 6. In size it is about half as large as the ordinary house fly. There is only one brood in the year, and the eggs are inserted into the fruit by the females with a sharp ovipositor. Egg-laying takes place from the beginning of July until autumn. The young maggots become full grown in about six weeks, and their work, as a rule, causes the fruit to ripen prematurely and fall to the ground, when the maggots work their way out and enter the soil for a short distance, where they change to pale-coloured puparia, but inside which they remain as maggots until the following spring The pupa forms only a few days before the perfect insects appear the next summer. The maggots of late-laid eggs are frequently in the fruit at the time it is picked, and these develop, destroying the fruit more and more as they grow. Apples apparently sound when gathered may, by the presence of eggs or young larvæ, afterwards become perfectly useless. The development of the maggot is slower in late and hard fruits.

In September last I received from Mr. R. W. Shepherd, the well known apple shipper, of Como, Que., samples of infested Fameuse apples, with the following information :—

'Montreal, Que., September 26.—I mail you to-day specimens of Fameuse apples taken from one of my orchards, an old one, which show serious blemishes. There is some disease unknown to me which has affected some of the Fameuse trees in that orchard. The outside skin of the apples shows dents, and, when the apple is cut open, there are brown punky spots in the flesh; the fruit is generally undersized, and in any case is practically worthless for sale. No other varieties are affected here, as far as I have been able to learn; but there are some other orchards which are suffering in a similar way to my own.

'October 10.—It is only my old orchard, which has been replanted at different times, that is badly affected. I have pigs there eating up the fallen fruit. I do not notice the maggots affecting any other variety than Fameuse, and in that orchard there are St. Lawrence, McIntosh Red, Scott's Winter, and other varieties. I noticed this injury last year for the first time, when the Shiawassee Beauty was affected. At that time I thought it was a fungus affecting the inside of the apple.

'October 20.—I am glad it was right to put pigs in the orchard; and, as they do not eat up the apples fast enough, I have given instructions that a herd of cows should be put in every day to make sure that all the fallen apples are done away with.'—R. W. Shepherd.

'Como, Que., October 25.—I thank you very much for your annual report. I am glad to have it, and hope to profit by your suggestions. Last year was the first time we noticed the Apple Maggot in our fruit; but it has increased a good deal this year. The McIntosh Red does not seem to have been troubled like the Fameuse, but Russets have.'—M. L. Gibb.

In addition to the above occurrence, apples from St. Hilaire, another celebrated locality for the production of first-class Fameuse apples, showed slight infestation. Como is thirty miles west of Montreal, and St. Hilaire twenty-three miles east.

Early and subacid varieties of apples seem to be preferred; but all varieties are said to be liable to attack, including late and winter varieties. When the late varieties are infested, the maggots do not emerge until some time during the winter after the fruit has been stored, the larvæ emerging and the pupæ forming inside the barrels or bins. The destruction of these pupæ and of all fruit when it falls to the ground during the summer and autumn constitutes the most reliable remedy for this injurious insect. The fallen fruit may be collected by children and fed to stock; or sheep and swine may be turned into the orchard from about the middle of July. Poultry will destroy many of the maggots and puparia beneath the trees. Late autumn ploughing will throw up many of the puparia to the surface of the soil, where they will be destroyed by birds, &c. Although the Apple Maggot has never done very much harm in Canada, the losses in Vermont, Maine and parts of New York State are sometimes extensive, occasionally amounting to 50 per cent of the fruit; and, as the injury does not show much on the outside, the uncertainty as to whether fruit is attacked or not renders it useless for sale. It may be well to point out here that, as the egg is inserted beneath the skin of the apple by the female fly, spraying with arsenical mixtures is quite useless as a remedy for this insect.

Codling Moth (*Carpocapsa pomonella*, L.).—One of the striking characteristics of the season of 1904 is the absence of injury by the Codling Moth, and this seems to be the case in all the fruit-growing districts of the country. I fear that this state of affairs may have an injurious effect by inducing many to give up spraying their orchards for the control of this pest. The absence of the Black Spot disease of the apple in 1903 had just this result during the past season. In some orchards which were free from disease in 1903, no spraying was done this year, and, as a consequence, what might have been beautiful crops have been ruined. Fungous diseases, although not caused by climatic conditions, are checked or developed enormously in accordance with favourable weather conditions or the reverse. The fruit-grower who is a good business man, has learnt before this that there is no longer any question as to whether spraying pays or not. That it does, is manifest every year by the predominant excellence of the fruit from all orchards which are sprayed, both as to insect presence and as to injury by fungous diseases. Mr. R. W. Shepherd, of Como, Que., and other buyers of the very best apples for the European market, assure me that, when purchasing the high quality fruit they require for that purpose, they cannot afford to waste time even in looking at orchards which have not been sprayed.

Although the Codling Moth was less destructive than usual this year, the presence of the eggs on apples and of the larvæ in fruit could be detected if closely looked for.

The weather throughout the past season has been such that insect occurrence of all kinds has been markedly less than has been the case for the last thirty years, so that the small numbers of the Codling Moth larvæ seen this year must not be taken as an indication that this most injurious enemy of the apple has disappeared to such an extent that spraying for it is no longer necessary. Moreover, it must be remembered that, by spraying apple trees at the times advised, viz., just when the buds are bursting and once a fortnight for two months afterwards, not only is the Codling Moth kept in check to the extent of saving an average of from 75 to nearly 100 per cent of the fruit, from its ravages, but also a great many other insects as well as fungous diseases are destroyed, giving the fruit-grower an enormous profit, compared with the cost of spraying.

GREEN FRUIT WORM (*Xylina*, sp.).—When examining orchards at Gagetown in New Brunswick, as well as in the Annapolis Valley and other places in Nova Scotia in June last, I frequently came upon the larvæ of a *Xylina*. These caterpillars, of which there are many species very similar in appearance, are known by the name of Green Fruit Worms, and have the habit of gnawing large cavities in the sides of apples, as well as devouring the foliage. The perfect moths from these caterpillars emerge in the autumn, and after passing the winter as such, lay their eggs on the trees in spring. The best remedy is the regular spraying of fruit trees with the poisoned Bordeaux mixture.

The RED-HUMPED CATERPILLAR (*Schizura concinna*, S. & A.).—This caterpillar feeds upon a great many different kinds of trees besides the apple, and is seldom destructive except upon young trees. The eggs are laid in clusters, and the caterpillars are gregarious throughout their lives. Mr. E. P. Venables, of Vernon, B.C., reports that they were numerous in his locality last summer and did much damage in young orchards, in many cases the whole foliage being stripped from infested trees. He detected a hymenopterous parasite which was doing good, and is now rearing specimens so as to learn the identity of this useful insect.

The SHOT BORER (*Xyleborus dispar*, Fab.).—There were several complaints from fruit-growers in the Annapolis Valley, N.S., of injury to apple and plum trees by the small wood boring beetle, which has received the name of the Shot Borer (Plate II, fig. 7). There has not been much complaint concerning this insect since 1897, but last spring its work was noticed in many places in the above district. The attack consists of a small black burrow (Plate II, fig. 8), beginning generally at a bud and running right round the stem inside the wood and near the bark of young living trees. Inside this there is often another burrow, and then a short perpendicular shaft at right angles running down the centre of the twig or branch. There is variation in the nature of the tunnels, according to the size of that part of the tree where they are located ; but they are always about one-sixteenth of an inch in diameter, and if in a small branch or stem form a circular gallery with an ascending or descending perpendicular shaft, which serves as a brood chamber. When, as is sometimes the case, they occur in trunks of young trees of moderate size, from 4 to 6 inches in diameter, the galleries are straighter and simpler. These galleries are the homes and breeding chambers of the larvæ and their mother; for, although this insect is the cause of much injury to trees, with the exception of the wood which is gnawed out to make the tunnels, the tissues of the wood are not eaten either by the mature beetles or the larvæ; but the tunnels form caves within which a special kind of fungus is cultivated by the beetles as food for the larvæ, which simply lie in a small cell and feed or are fed by their parents on the fungus as it grows. An account of these beetles and their method of feeding upon the 'ambrosia' is most delightfully described by the late H. G. Hubbard, in an article entitled 'The Ambrosia Beetles of the United States,' one of the most charming narratives to be found in the literature of Economic Entomology. (See Bulletin No. 7, n.s., U. S. Division of Entomology.)

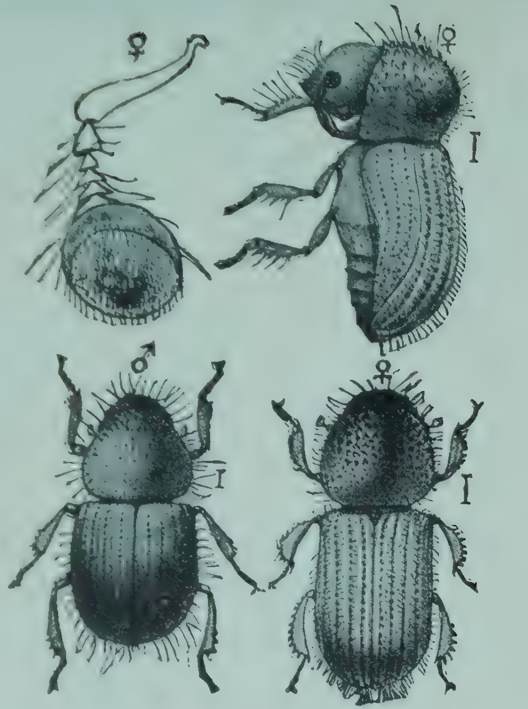


Fig. 7.—Shot-borer : ♂ male ; ♀ ♀ female—enlarged ; antenna of female—more enlarged. *(Figs. 7 and 8 from H. G. Hubbard, U.S. Dept. of Agriculture.)*

Fig. 8.—Gallery of Shot-borer in twig, cut across and lengthwise.

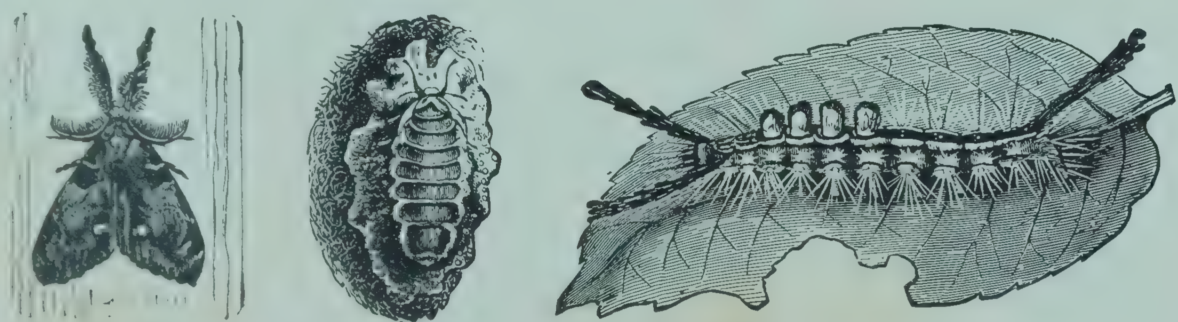


Fig. 9.—The White-marked Tussock-Moth : male, female and caterpillar.

Fig. 10.—Branch of Canada Balsam Fir, with roots from base covered by sand. *(Photo. by F. T. Shutt.)*

The remedies for this insect aim at either filling up the entrances to the holes in vhich the broods are being reared, so as to suffocate the larvæ, or in applying some iquid which will penetrate and destroy the fungous food or the larvæ and mature beetles vhile in the holes. For this purpose, kerosene oil and carbolic washes have been used vith success; crude petroleum could probably be used with even greater effect, as on ccount of its extreme subtility it would penetrate the burrows more deeply than most iquids, and also would act as a deterrent wash which would keep the mature beetles way from the trees when seeking places to make their breeding burrows.

The carbolic wash which has given good results in Nova Scotia is soft soap, 1 allon, water 3 gallons, crude carbolic acid ½ pint; the trees to be washed two or three imes when the beetles are known to be prevalent. A difficulty with this insect will be ound in the intermittent nature of its occurrence. As it is pretty sure to be present n some numbers in the same orchards where it was troublesome last spring, it will be vise for the owners to spray or wash their trees with a deterrent wash next season. 'rees noticed to be badly infested at the time of winter pruning should be cut out and urnt before the beetles appear in spring, unless considered to be of special value, when hey may be treated.

The BLACK VINE WEEVIL (*Otiorhynchus sulcatus,* Fab.).—This weevil seems to ave become a regularly occurring pest in gardens around Victoria and some other laces on Vancouver Island, and also near New Westminister and Vancouver on the nainland. It is a black snout-beetle, three-tenths of an inch in length, of a dull black, he wing cases being deeply grooved and spotted with fine white points. The grubs are ellowish white, with dark heads, and have the body somewhat curved; they feed on he roots of several kinds of plants. These beetles have no true wings and the two ving-covers are connate or joined together in the middle, so their only means of preading from place to place is by crawling. The beetle occurs near the coast on both ides of the continent and is sometimes a destructive pest in strawberry beds in Nova Scotia and British Columbia. The plants which have been reported to me as injured y the Black Vine Weevil in Canada do not include the grape vine; the name Black Vine Weevil is taken from European publications, where it is the recognized popular name, and will answer here until a better is suggested. The grubs probably do more iarm than the adult weevils and have been found attacking the roots of Cyclamens nd other plants in greenhouses, particularly Gloxinias, Primulas and Maiden-hair erns. The most important injury so far recorded against this weevil is of its attacks ıpon strawberry beds. Mr. J. R. Anderson, reporting on the insects of the season, says the Black Vine Weevil did a considerable amount of injury to strawberry beds. This vas principally on the lower Fraser. It also attacked the roots of Primroses in some ocalities.'

'New Westminster, B.C., May 30.—The Strawberry Weevil (*Otiorhynchus sulcatus*) is very bad in several places this spring, and I find that in every case where trawberries are infested, they have been planted on land where the sod had been urned in previously, and that in neighbouring patches where no sod had been turned n they are comparatively few.'—W. D. DASHWOOD-JONES.

'Victoria, B.C., May 30.—I send you specimens of larvæ and pupæ of an insect vhich is in large numbers in a strawberry bed at Esquimalt, near here. I take these to be *Otiorhynchus sulcatus*; am I right ? There are many complaints of injury to strawberry plants this spring from this or a similar pest, chiefly along the Fraser at Hammond, Haney and Mission, but also in the Victoria district.'

'June 13.—I will send you further specimens of *O. sulcatus* from Mr. Fleming's garden near Victoria, and I will also try and get you other specimens from the lower nainland, where by the bye, I am told by Mr. Cunningham that there are two distinct species of weevils infesting strawberry plantations.'

'June 20.—I send you a box containing specimens of weevils, principally in the pupal form, but also including some beetles which were taken from strawberry fields

at Hammond. You will see that there are two species, one much smaller than t other. From the appearance of the infested plants, I take the larger specimens to either *Tyloderma fragariæ*, or *T. foveolatum*. Will you kindly identify and sugge remedial measures?'—R. M. PALMER.

The specimens sent forward by Mr. Palmer were extremely interesting, a showed distinctly the work of two different insects which attacked the roots in a si ilar manner, but could be easily distinguished. All the plants sent were old plan with large crowns, from a stout caudex; and it was into this that the larvæ bored fro the outside, leaving large cavities, and in some instances destroying the whole of t interior of the stems. By the time the parcel reached Ottawa, most of the specime were pupæ, and from these a little later I reared several specimens of the Black Vi Weevil and of the SLEEPY WEEVIL (*Otiorhynchus ovatus*, L.). This latter is a co mon weevil, and is a curious slow moving creature, which is frequently found in ou of-the-way places. It may always be found out of doors at almost all times of t year, when sifting moss or leaves to collect beetles. It frequently penetrates in houses, sometimes in large numbers, and it has even been accused, with every appea ance of good reason, of having inflicted very painful bites on campers sleeping tents during the summer time. It occurs commonly throughout Canada east of t prairies, but I had not heard of it previously from British Columbia. The Slee Weevil has occasionally been accused of injuring potatoes, and Mr. P. J. D. Edmon sent me from Summerville, P.E.I., specimens with potato leaves, and the followi note: 'I send you a sample of a new kind of potato beetle, showing the way he fol himself up after cutting off the branches of potatoes. Please let me know what th is, and whether he is doing damage or how he can be destroyed. I did not actual see this field, but I am told that many of the stalks are stripped bare of leaves.'

The Sleepy Weevil is only about half the size of the Black Vine Weevil, and of a dull pitchy brown colour, smooth and without any markings. It is always a ve slow moving beetle, and it is probable that some injury may have been attributed to for which it was not responsible. From its habit of hiding in dark corners, fold leaves and in hollows, it is frequently found in close proximity to injury which m have been done by other culprits. There is now no doubt that the larvæ feed on t roots of strawberries, and it is probable that they also attack the roots of many oth plants. I have frequently found the beetles in old grass fields, and I shall not be su prised, especially after the observation made by Mr. Dashwood-Jones that strawber beds planted on sod were most injured by weevils, to find that the usual food plant both the Sleepy Weevil and its larger companion, the Black Vine Weevil, may be t roots of grasses. Should these insects become abundant in strawberry beds it will well for growers to adopt the one-crop plan which has been used very successfully Mr. Macoun, the Horticulturist of the Central Experimental Farm, and was adopte many years ago by Mr. Peter Dempsey, at Trenton, Ont. This consists of settin out new beds of strawberries in the spring, cultivating these for the first summe taking one large crop of berries the next spring, and then ploughing the plants up soon as the crop is off. In the meantime a new bed will have been set out from th runners of the bearing bed early in spring before the fruit ripened. This plan strawberry culture not only prevents loss from the attacks of such enemies as th White Grub and the above-mentioned Weevils, but is also a paying operation, givin better returns from the higher price secured with the large fruit thus grown than fro a large crop of smaller berries.

Both of the weevils here treated of are nocturnal, doing such injury as is attri butable to them at night and remaining quiet by day, hidden away in crevices o beneath rubbish and other shelters. They can, therefore, be trapped in considerabl numbers by placing objects about the beds convenient for them to hide in by day, an also easy of examination for the destruction of the beetles.

FOREST AND SHADE TREES.

No widespread or extensive injury to forest or shade trees was brought to my otice during the past season, but there were many inquiries sent in with specimens r information concerning these insects.

TENT CATERPILLARS of several species, which a few years ago were so enormously oundant, but which everywhere suddenly decreased in 1900, seem to be again increasg in certain districts, not only on forest trees, but also in orchards. There is some onfusion as to the species mentioned in reports; but western references are probably *Malacosoma (Clisiocampa) californica,* Pack., and *M. americana,* Fab., northwestern *M. disstria,* Hbn., and *M. fragilis,* Stretch, and eastern to the Apple Tree Tent aterpillar, *M. americana,* and the Forest Tent Caterpillar, *M. disstria.*

Mr. J. R. Anderson says:—

Victoria, B.C., Nov. 1.—The Tent Caterpillars again appeared in larger numbers an usual this year. In some localities on the lower Fraser and in those places here no steps were taken to check their ravages, fruit and ornamental trees were tterly defoliated, and this was also the case with trees and bushes on the roadside.'

When travelling in northern Alberta last summer, holding meetings with Mr. . N. Willing, the Territorial Weed Inspector and Entomologist, I found, on July l, two destructive colonies of what I took to be the Forest Tent Caterpillar *(M. sstria).* The first one was in a bush of many acres of Aspen Poplars, a few miles out f St. Albert. The moths were in thousands and were just emerging from the ocoons. Only a few dipterous and hymenopterous parasites were noticed at large r detected by their larvæ in the cocoons. The second colony was close to the town f St. Albert and was less extensive than the first one referred to, the chief injury eing done on the tops of young aspen trees. Earlier in the season Mr. Willing sent e specimens of the larvæ of *Malacosoma fragilis,* Stretch, which he had found abunnt on rose and other bushes at Medicine Hat. There are a few reports of injury y Tent Caterpillars in orchards and wood lots in western Ontario; and I hear from ova Scotia that Tent Caterpillars are evidently again increasing in numbers.

The remedy for all these species, where practicable, is prompt spraying as soon s the young caterpillars appear, with poisonous mixtures.

BASSWOOD LOOPER [*Erannis (Hibernia) tiliaria,* Harris].—Mr. T. N. Willing und caterpillars of this eastern moth very abundant on the flat north of the south anch of the Saskatchewan at Medicine Hat. They were stripping the Negundos or sh-leaved Maples (also called Box-elders in the United States), and skeletonizing all e leaves on some trees over an area of more than two acres. A moth was reared om these caterpillars, which like the larvæ, did not appear to differ in any way from stern specimens.

The NEGUNDO TWIG-BORER (*Proteopteryx willingana,* Kearf.).—For many years the h-leaved Maples grown at Winnipeg, Brandon, Regina and other points in the West s street shade trees, have been injured every season by the caterpillars of a small oth, which burrow in the bases of small twigs and branches, and hollowing these it, cause them to swell and form elongated galls. These have occasionally been ared, and some years ago moths were sent to a specialist who identified them as *roteoteras æsculanum,* Riley. Under this name the insect has been referred to until e present season, when several specimens were reared by Mr. T. N. Willing, of egina, and were forwarded to Mr. W. D. Kearfott, a specialist in microlepidoptera.

(See 'Canadian Entomologist,' vol. xxxvi., 1904, p. 306.) After careful examination they were decided to be an undescribed species, which was named in honour of Mr. Willing, as a recognition of the excellent work he is doing in working up the natural history of the North-west Territories. The caterpillars attain full growth during June and then leave their burrows in the twigs, and penetrating a short distance into the ground, spin close cocoons from which the moths emerge early in July. Some caterpillars of this moth, however, reared here in the Division of Entomology, pupated in the twigs where they had been feeding. It cannot be said that this insect does very serious injury to the Negundos; but it is sometimes extremely abundant and by destroying shoots makes it difficult to train these favourite trees in the way desired by those growing them as shade trees.

The NEGUNDO PLANT-LOUSE *(Chaitophorus negundinis,* Thos.).—As might be expected from the enormously extended area over which the Ash-leaved Maple or Box-elder is cultivated of late years, the insects which attack it are gradually spreading from the west with their host plant. One of the most troublesome of these is the Negundo Plant-louse, which for many years has been a disgusting pest of shade trees in the West, covering the trees with honey-dew during the summer and making them very unsightly objects instead of ornaments, in the streets, by reason of the copious growth of the Sooty Fungus (*Fumago salicina*), which always develops as a consequence of their attack. From several points in Ontario during the past summer, even as far east as Ottawa, this plant-louse was reported upon the Ash-leaved Maple trees. When not controlled by spraying with kerosene emulsion or whale-oil soap solution, these plant-lice do serious injury to the trees they infest; and they are so persistent in their attacks that many lovers of trees in the West have given up the cultivation of the desirable and quick-growing Negundo, for other trees less subject to insect attack.

The ASPEN BEETLE *(Lina tremulæ,* Fab.).—Mr. Norman Criddle, of Aweme, Man., writes : 'These beetles, which three or four years ago were so enormously abundant and did so much harm by stripping the aspen poplars, are once more on the increase. They were especially destructive to the young shoots of the aspens, causing many young trees to die.'

In 1900 and 1901 this bettle was so abundant and destructive on the prairies that many miles of beautiful aspen poplars so useful in that country for firewood and shade, were stripped bare of foliage, and a great many of the trees died. This was particularly the case in the Tiger Hills, Man., and in the Moose Mountain and Qu'Appelle districts, N.W.T.

WILLOW BEETLES.—For the last three years willows in the prairie provinces and in British Columbia have been very much injured by the small chrysomelid beetle, *Galerucella decora,* Say. This is a small brown beetle, soft, and rather flat in shape, which, both in the perfect and larval states, feeds on various kinds of willows, stripping the green surface of the leaves and leaving the bushes seared and brown. Mr. Criddle says: 'Willows at Aweme were completely stripped by these beetles and their larvæ. Later in the season, aspen poplars (*P. tremuloides*) were also attacked by the same beetles to such an extent that any one knocking a tree would shake down countless numbers from the leaves, which sounded, as they fell on the dead leaves beneath, like a shower of rain. These insects pass the winter beneath the dead leaves, and attack the trees as soon as they come into leaf the following spring. Many trees were killed by them some years ago.'

The VANCOUVER ISLAND OAK-LOOPER [*Therina (Ellopia) somniaria,* Huslt].—As stated in my report for 1890, the beautiful oaks on Vancouver Island are periodically stripped, every few years, by hordes of the caterpillars of a geometrid moth. 1904 saw one of these visitations. Mr. J. R. Anderson writes: 'The Oak Looper (*Ellopia somni-*

aria) appeared in vast numbers in some places on Vancouver Island this year. Strange to say, in certain localities they were entirely absent, but in others they were so numerous that they consumed every particle of their natural food, and they would then attack other trees. In one place, which I was called to inspect, I found that they had attacked even the fruit on apple trees, eating away a layer of the skin and large holes into the interior near the stem. They were also denuding the apple trees of their leaves. There were hundreds on one tree which stood beneath an oak. The larvæ had defoliated the oak tree, then let themselves down in the usual manner, and were on the apple tree in hundreds eating the foliage and fruit. Other trees, as cherry, elm, &c., farther away were also attacked, but not so much as those near the oaks.'

This variation in the food habits of this insect can, I think, only be considered as exceptional. The natural food of the species in Vancouver Island is the picturesque oak, *Quercus jacobi*, R. Br., which grows round the southern end of Vancouver Island. Among the caterpillars forwarded by Mr. Anderson, some parasitized specimens were found, from which was raised a parasite which has been kindly identified by Mr. W. H. Harrington, as *Pimpla Ontario,* Cress. Another parasite, the species usually responsible for the sudden reduction in the numbers of this species, is *Ichneumon cestus,* Cr., a yellowish brown ichneumon fly about three-eighths of an inch long, with one black band across the abdomen, and was found in considerable numbers by Mr. A. W. Hanham, who writes:—

'Victoria, B.C., October 25.—The moths of the Oak Looper (*E. somniaria*) have this autumn been a sight to see. Out the Cadboro Bay road large oak trees were covered with the moths a couple of weeks ago, particularly on the underside of the branches and close to the trunks. There were numbers of a reddish brown ichneumon, all of one species, which were flying about the trunks of the trees. I bottled several of these, which I send you.'

The specimens forwarded by Mr. Hanham were *Ichneumon cestus,* Cr.

The White-marked Tussock Moth [*Hemerocampa (Orgyia) leucostigma,* S. & A.] —This common pest of city shade trees, which was referred to at some length in my last report, continues to injure shade trees in some of our cities. The most effective remedies are the collection of the egg masses in winter and the spraying of the trees with arsenical poisons in spring before the caterpillars (Plate II., fig. 9) have grown much and injured the leaves. The Toronto civic authorities are this year taking active measures to clear out the infestation, which for many years has injured the appearance of the beautiful horse chestnut trees for which Toronto is celebrated. A reasonably large sum of money has been voted for the collection and destruction of the eggs during the present winter; and there is every reason to hope that by this means private individuals may be stirred up to do their duty in the public interest by destroying the eggs on their own trees in winter and then spraying the foliage in summer for a year or two.

Walking Stick Insect *(Diapheromera femorata,* Say).—A remarkable outbreak of the Walking Stick Insect, which is worthy of record, is reported by Mr. J. B. Williams, of Toronto. This is usually a rather uncommon insect; but Mr. Williams found it in such numbers in the Niagara Glen that thousands might have been collected on oak and butternut trees during September. These trees are ordinary food plants for this curious insect, which belongs to the Phasmidæ, a division of the Orthoptera, the same order as contains the locusts and grasshoppers.

THE APIARY.

The Apiary, as in the past, has been under the management of Mr. John Fixter, the farm foreman, whose report I append herewith. The same experiments which have been carried on for some years have most of them been repeated on account of the large amount of interest which has been evinced in the subject by correspondents and visitors to the Central Experimental Farm. The services of Mr. Fixter have been asked for at a great many meetings of bee-keepers, and, whenever his duties at the Central Experimental Farm would permit of it, he has attended these meetings and given addresses.

REPORT OF MR. JOHN FIXTER.

SEASON OF 1904.

The honey crop in the Experimental Farm Apiary has been a fairly good one, giving an average yield of 63 pounds per colony.

In many parts of the Dominion the honey crop was light, owing chiefly to the very heavy losses of the past winter. Many colonies of bees perished from cold, while they had abundance of stores in their hives. The continued long spells of severe weather prevented them from breaking their clusters to reach their stores. Losses were greater in outside than in inside wintering, although many perished inside, either from insufficiency of stores or from confinement in cool, damp and badly ventilated cellars.

Experiments have shown that bees can be successfully wintered in a good cellar, even if it is damp, providing it is well ventilated. Many colonies died also during the spring after being set out, owing to the cold, backward season.

The number of colonies, which was 35 in the spring, was increased by swarming to a total of 50 when the hives were put into winter quarters on November 23.

Meetings were attended at the following places in Ontario :—Merivale, Metcalfe, Crossland, Phelpston, Minesing, Grenfell, New Lowell, Stayner, Elpin, McDonald's Corners, Balderson, Innisville, Drummond Centre, Locust Hill, Markham, Gananoque, Toronto and Barrie; and in the province of Quebec at Shawville, Buckingham and Venosta.

EXPERIMENTS, 1903-1904.

I. CELLAR WINTERING.

Description of the Bee Cellar.—The cellar is below a private house. The walls are of stone and the floor of cement. The bee-room, 11 feet 6 inches wide by 15 feet long and 7 feet high, allows three tiers of shelves and two passages. It is boarded off from the remainder of the cellar by a partition which extends all around the chamber, and far enough from the stone wall to allow of an air space. Should a person have enough bees to fill the cellar the boarding could be left out. Under the cement floor a layer of one foot of stones of different sizes acts as a drain and keeps the cellar perfectly dry. The lowest shelf is 18 inches from the floor, the second 20 inches in the clear above, and the third 20 inches above that. Neither the hives on the third or uppermost shelf nor the uprights supporting the shelves touch the ceiling, so that no vibration can reach the hives from above. This chamber is thoroughly ventilated, as is also the whole cellar.

Before entering the bee room is a smaller compartment with a door leading to the outside and another leading to the bee-room. Both rooms have sliding ventilators in the doors, so that outside air may be let in at will. Ventilation is carefully attended to, and sudden changes of temperature are avoided; for this, a thermometer which is

always kept in the cellar, is watched. The best temperature for the bee cellar has been found to be from 42 to 48 degrees Fahrenheit. This arrangement has given entire satisfaction. In former years there was not proper ventilation, and the cellar was always damp. Since the concrete floor has been laid and the ventilators have been put in, the cellar has been much drier and cleaner. It is also rat and mouse proof, which is a very great advantage.

Experiment No. 1.—The tops of the hives replaced by chaff cushions and the brood chambers raised at the back.

Six colonies were put into winter quarters in the cellar and placed on the shelves. Under the back end of each hive was placed a three-inch block; each hive was, besides, raised from its bottom board by a one-inch block being placed at the back so as to ensure free ventilation. All front entrances were left wide open; the wooden covers were all removed and replaced with cushions made of chaff 4 inches thick, sufficiently wide and long to lap over the hive two inches. Temperatures were taken once each week all through the winter and were kept very even, from 44 to 48 degrees. The bees were quiet, only a very slight hum being noticeable up to February, when the temperature having risen to 48, the bees began to get uneasy and made considerable hum. Cold air was carefully let in during the night by opening the slides in the doors and closing them in the morning; this, of course, lowered the temperature, and the bees quieted down. During the past winter every colony in this experiment was perfectly dry and clean, and all came out in excellent condition. Average weight of each hive when put into winter quarters, 58½ pounds; when taken out on April 22, 49¼ pounds per hive, showing that each hive had lost 9¼ pounds on an average.

Experiment No. 2.—Tops replaced by chaff cushions and the brood chambers raised in front.

Six colonies were put into the cellar and placed on the shelves, a three-inch block being placed only in front, between the bottom board and the brood-chamber, making the full entrance three inches high across the whole front. The wooden covers were removed and replaced with a chaff cushion. Temperature the same as in Experiment No. 1. During the whole winter all the colonies in this experiment were perfectly dry and clean and showed no uneasiness of any kind. The bees could be seen hanging in a quiet cluster below the frames any time during the winter. The average weight when put into winter quarters on November 23 was 59 pounds 12 oz.; when taken out on April 22, 51 pounds 8 oz., showing that each hive had lost on an average 8 pounds 4 ounces.

Experiment No. 3.—Tops replaced by propolis quilts.

Six colonies were put into the cellar and placed on the shelves, with the bottoms of the hives left on, just as they were brought in from the bee-yard. The wooden covers were removed and nothing left on except a tightly sealed propolis quilt; the natural entrance was left wide open. Temperature of cellar same as in Experiment No. 1. During the entire winter the bees kept perfectly dry, and only a very slight hum could be heard. There were but very few dead bees on the bottom board, and no sign of dysentery. On examination when set on their summer stands all the hives were found to be in first-class condition. The average weight when put into winter quarters November 23 was 59 pounds 15 oz.; when taken out on April 22, 51 pounds 3 oz., showing that on an average each had lost 8 pounds 12 oz.

Experiment No. 4.—Tops and bottoms of hives left on.

Six colonies were put into the cellar and placed on the shelves, with tops and bottom boards of the hives left on, just as they were brought in from the bee-yard.

They were watched for dampness, mould, or dysentery, also to compare the amount of honey consumed. Temperature of cellar the same as in Experiment No. 1. During December and January all were very quiet. During February there was considerable humming. Drops of water were noticed along the entrances of three hives. There were but very few dead bees on the bottom board and no sign of dysentery. On examination when set on their summer stands, two of the hives had considerable moulded combs. The average weight when put into winter quarters, 58 pounds 10 oz.; when taken out on April 22, 49 pounds 3 oz., showing that the average loss of each hive was 9 pounds 7 oz.

II.—WINTERING BEES IN DAMP CELLARS.

Many letters are received inquiring whether a damp cellar is a fit place to winter bees in. An experiment was conducted during the winter of 1902-3, with three colonies of bees. During last winter it was thought advisable to try the same experiment (A) with a larger number of colonies—six—and another (B), also with six colonies with a larger amount of moisture.

In both experiments the six colonies were selected, all of about equal strength, and all in Langstroth hives, weighing on an average 58 pounds each at the beginning of the experiment. The wooden covers were removed from the hives and replaced with propolis quilts ; the bottom of each hive was loosened from the brood chamber, and a block two inches square was placed at each corner between the bottom board and the brood chamber, insuring free ventilation from the bottom of each hive. The cellar was kept at a very even temperature of 44 to 48 degrees, and was well ventilated during the whole winter. The six hives in each experiment were resting on the edges of seven pails of water, the full surface of the water being exposed.

A.—The bees could be seen hanging below the frames in a quiet cluster all winter. The hives were all examined once each week, and at no time did there appear to be any sign of uneasiness from the extra moisture. There were scarcely any dead bees on any of the bottom boards nor any sign of dysentery, and all came out in excellent condition. The colonies were set out on their summer stands on March 20; the day being fine and warm, all began to fly at once. The average weight of the six colonies when set on their summer stands was 44¼ pounds each. From March 20 to April 5, the weather was cool, and no flying took place up to the latter date, which was a good bright warm day. After this the bees had to remain in their hives until April 22, when the weather became warm again. They then built up rapidly and were in excellent condition for the honey flow.

B.—A second experiment was tried in which the amount of moisture in the atmosphere of the cellar was increased in the following way: Besides the seven pails of water placed on the floor with the six hives resting on the edges of these pails, allowing the full surface of the water to be exposed, six inches of sand was spread on the cellar floor between the pails and covering six inches of the floor outside of the pails. There was also a large cotton sheet spread over the six hives. The sand and sheet were kept thoroughly saturated with water which was poured on them once each week during the winter.

The bees in this test were more uneasy than in the experiment first described where no sand or cotton covering was used, having to keep up fanning for ventilation. There were also a great many more dead bees on the bottom boards and several hives had drops of water along the entrance, but there was no sign of dysentery. On March 20, the day being fine, the colonies were removed to the bee-yard, where all began flying at once. The average weight of the six colonies when set on their summer stands, was 44¼ pounds each. From March 20 to April 22 the bees had but one good flight. After April 22 the weather became considerably warmer; the colonies began building up rapidly, and were in excellent condition for the clover bloom.

The average strength of the six colonies that had the extra moisture was not as great as in the former test, but as soon as they got fine weather they gained rapidly.

Care was taken that the colonies in both tests had plenty of unsealed stores before fruit bloom and between fruit and clover bloom. This was done by uncapping one side of a frame of honey nearest to the cluster, allowing the bees to use up the honey for food and providing space for the queen to lay her eggs. Although so much moisture was in close proximity to the colonies, a great deal of the success of this experiment is no doubt due to the good cellar in which it was tried, the cellar having stone walls, cement floors, good ventilation and the temperature being easily regulated. This goes to show that good ventilation and even temperature have a great deal to do with successful wintering. An excellent plan for ventilating is to have sliding ventilators in the doors, so that much or little air may be let in as desired. Also connect an extra stove pipe, provided with a damper, to the regular heating stove. This may be done by means of a T, or an extra flue will answer. Allow the pipe to extend into the cellar. This plan of ventilating has proved very successful.

III.—INSULATING HIVES FOR OUTSIDE WINTERING.

For this experiment, the hives were insulated against the winter cold by air cushions in the following manner. Slats 1 inch thick were nailed at intervals all around the hive, on these was tacked one layer of thick brown building paper and then a layer of oiled paper, which increases durability and also keeps out vermin. In order to provide extra protection to the hive, a box six inches wider and six inches longer was placed over this with an opening cut at the entrance, 1 inch by 2 inches, all other openings being closed. The wooden covers of each hive were removed and replaced with a chaff cushion 3 inches thick, the latter placed on the propolis quilt, and lapping over the sides of the hive; two layers of paper were then put on top of the cushion and a second cushion added, which had the top of the outside box over it. This experiment, first tried during the winter of 1902-3 with two hives, was repeated last winter for the second time with four colonies in Langstroth hives. These were all four placed in a large packing case, one foot larger each way than the hives, which were six inches apart in the case, with six inches of cut straw on the bottom of the case for the hives to rest upon. The six-inch space between the hives was packed with cut straw, as well as the one-foot space all around and on top of the hives. The entrances of two of the hives faced each other, and two hives faced west. The entrance to the hives was kept clear of snow all winter to ensure free ventilation. The hives were in a corner well sheltered from cold winds.

No sound could be heard from these colonies all winter. On March 22 the bees made their appearance, many flying briskly, going out and returning. From March 22 to April 22 the bees had but one good flight. On April 22 they were then examined. Very few dead bees were found on the bottom boards; the combs were dry and clean and there were no signs of dysentery. The hives were then removed from the packing case and placed on their summer stands. The average weight of the hives when put into winter quarters was 62½ pounds; when put on their summer stands, 49¼ pounds, showing that each hive had lost 13 pounds 4 ounces. The weather after this date (April 22) being bright and warm, the bees built up rapidly and were in excellent condition for the honey flow.

IV.—EXPERIMENTS TO DETERMINE WHICH BEES WOULD CONSUME MOST OF, HONEY OR SUGAR, WHILE CONFINED IN THEIR WINTER QUARTERS.

Eight colonies in Langstroth hives were selected for this experiment, all of as nearly equal strength as could be secured. On September 1 their natural stores were removed from both sets. On September 2 all were weighed as follows:—

(*a*.) The four colonies fed sugar syrup: No. 1 weighed 30 lbs. 7 oz.; No. 2, 31 lbs. 12 oz.; No. 3, 31 lbs. 10 oz.; No. 4, 31 lbs. 3 oz.; average of weight, 31 lbs. 4 oz.

(*b*.) The four colonies fed extracted honey: No. 1, weight, 30 lbs. 9 oz.; No. 2, 31 lbs. 10 oz.; No. 3, 30 lbs. 12 oz.; No. 4, 31 lbs. 1 oz.; or an average of 31 pounds.

Miller feeders were placed in empty section supers, close to the top of the brood frames, any part of the brood frames not covered by the feeder being covered by a propolis quilt cut so as to allow the bees a passage through it. By keeping the feeder well packed around, except where the bees enter, the heat is kept in and at the same time the bees cannot daub themselves with the liquid. In both experiments the bees had a constant supply of syrup and honey. Both the honey and the syrup were supplied to the bees at about blood heat. The syrup was made of the best granulated sugar, two parts to one of water by weight. The water was first brought to a boil, then the boiler was set back on the stove and the sugar having been poured in, the mixture was stirred until all was dissolved.

The four colonies fed sugar syrup when put into winter quarters November 24, weighed as follows:—

No. 1, 61 lbs. 4 oz.; No. 2, 62 lbs. 9 oz.; No. 3, 62 lbs. 7 oz.; No. 4, 62 lbs.; or an average of 62 lbs. 1 oz. each.

The four colonies fed extracted honey when put into winter quarters on November 24, weighed as follows:—

No. 1, 62 lbs. 13 oz.; No. 2, 62 lbs. 14 oz.; No. 3, 62 lbs.; No. 4, 62 lbs. 5 oz.; or an average of 62 lbs. 8 oz. each.

The four colonies fed sugar syrup when taken from their winter quarters March 22, weighed as follows:—

No. 1, 47 lbs, 3 oz.; No. 2, 49 lbs. 4 oz.; No. 3, 51 lbs. 5 oz.; No. 4, 51 lbs. 8 oz; average, 49 lbs. 13 oz.

The four colonies fed extracted honey when taken from their winter quarters March 22, weighed as follows:—

No. 1, 50 lbs. 9 oz.; No. 2, 53 lbs. 1 oz.; No. 3, 51 lbs. 12 oz.; No .4, 51 lbs. 2 oz.; average, 51 lbs. 10 oz. Difference in favour of the honey feeding, 1 lb. 13 ounces per colony.

When the hives were put into winter quarters and placed on the shelves in the cellar, the wooden covers were raised at one end ½ an inch, while the sealed propolis quilt was left undisturbed. The hives were all given extra ventilation at the bottom by placing at the entrance a wooden block between the bottom board and the brood chamber, thus raising the front of the brood chamber 3 inches extra. During the balance of November and December very slight humming could be heard; during January and February scarcely any appreciable hum could be heard. During the whole winter there was no sign of uneasiness of any kind, and very few dead bees were found about the entrance; the bottom boards were quite clean and there was no sign of dysentery in either experiment. All came out in first-class condition and built up rapidly for the honey flow.

V.—EXPERIMENT WITH QUEEN EXCLUDERS IN HIVES FOR THE PRODUCTION OF EXTRACTED HONEY.

Eight colonies were taken for this test—4 in Langstroth hives, 4 in Heddon hives.

Two colonies in each case had queen excluders between the brood chamber and the extracting frames; thus, every pound of honey secured was pure.

The two remaining colonies in each set had no queen excluders. The queen in every instance went up into the extracting frames where eggs were laid and young brood raised. This latter plan is practised by too many who call themselves bee-keepers. It is impossible to extract honey from frames where brood is present without throwing out the young larvæ at the same time. There are also many who do not use any surplus cases, especially those who use the old box hive. They take their honey out of the brood chamber after smoking or killing the bees. This

practice is to be strongly condemned, as the honey taken out of a brood chamber, or out of extracting frames where brood is present is not fit for human food.

On November 8, all colonies were weighed and found to be in good condition. They were then put into their winter quarters.

Introducing Queens.

Eight queens have been introduced during the season, four on the Benton plan and four with frames of brood taken from several hives. All queens belonging to the colonies that were to receive the imported queens, were removed 24 hours before introducing the new queens.

ONE METHOD—'BENTON INTRODUCING CAGE.'

The Benton mailing and introducing cage is ordinarily used in this country. It consists of an oblong block of wood with three holes bored nearly through, one of the end holes being filled with good candy, and the other two being left for the occupancy of the bees and queen. On the back of the cover are printed directions for introducing a new queen into a hive, and at each end of the cage is a small hole bored through the end of the block of wood, but which in the mails is stopped by a cork. One hole is for the admission of the bees and queen preparatory to mailing, and the other for the liberation of the queen, by the bees eating out the candy in the course of 20 to 30 hours, thus releasing her in a natural way. When the cage is received, the cork covering the candy is to be removed, as well as the wooden cover over the wire cloth. The cage is then carefully placed on top of the frames, so that the wire cloth be over the space between two frames in the centre of the brood-nest. The queen will then be released by the bees in the manner explained.

I would advise all to have extra cages for introducing, so that no disease may be brought in with the queen. See that the cage you introduce with is thoroughly cleaned, and have fresh food made from your own honey placed in the cage in readiness. Then remove the queen and bees from the cage they were received in, to the one prepared for them and follow the above directions.

How to Make Honey and Sugar Thick for Feeding.

Take good thick honey and heat (not boil) it until it becomes very thin, and then stir pulverized sugar into it. After stirring in all the sugar the honey will absorb, take the mixture out of the vessel, and thoroughly knead it with the hands. The kneading will make it more pliable and soft, so that it will absorb or take up more sugar. For summer use it should be worked, while mixing in a little more sugar, until the dough is so stiff as to be hard to work; it should then be allowed to stand for a day or two; and, if still so soft as to run, a little more sugar should be kneaded in. A good deal will depend upon the season of the year; there should be more sugar in proportion to the honey in warm weather than in cool weather.

ANOTHER METHOD OF INTRODUCING QUEENS.

Select a strong colony, remove the wooden cover of the hive, and place a fine wire netting over the tops of the brood frames to shut in the bees; place on top of this wire cloth a brood chamber with four frames of well sealed brood, selected from different hives, with young bees just hatching out, but with no unsealed brood. Put the queen in this brood chamber, which should then be closed bee-tight, and kept over the strong colony four or five days. By that time a respectable force of young workers will have hatched; the hive may now be placed on the stand where it is to remain, the entrance being made large enough for only one bee to pass at a time, as a precaution aganist robbing. The entrance may be widened as the colony gets stronger. This latter plan has never failed with me.

JOHN FIXTER.

DIVISION OF BOTANY.

THE RUSTS OF GRAIN CROPS.

The losses from the attacks of different kinds of rusts on the cereal crops of the Dominion during 1904, were considerable, and have been reported from every part of the Dominion. In Manitoba and the North-west Territories rust on grain is very seldom heard of; but during the past autumn just about the time the grain was ripening the climatic conditions were such that rust developed to an alarming extent. The parasites which cause this disease are always present to a certain degree on grain crops as well as on several kinds of the wild prairie grasses, and this year they spread on the grain crops and were the cause in some places of great loss to farmers. There was so much interest created among settlers in the West that I was requested to prepare an article upon the subject for the Montreal *Family Herald and Weekly Star,* which was published in the issue of November 30 last. As it is of general interest and a great many inquiries have been made for a popular description of the disease and its cause, I reproduce the article herewith.

THE RUST OF WHEAT.

The subject of the rusts of grain crops is of special interest just now, owing to the unusual epidemic of these destructive parasites in the large wheat fields of parts of Manitoba and the eastern North-west Territories during the past season.

The loss from this cause was undoubtedly considerable; but there was no such wholesale or widespread destruction of the wheat crop in the prairie provinces, as was described in some United States and English newspapers. I have had opportunities of examining samples of rusted straw from many localities, which have been kindly sent in by Mr. David Horn, Chief Inspector of Grain, at Winnipeg, by the agricultural papers and by several correspondents. As a report on the whole of these samples, it may be said that, although some were seriously affected by rust, not one of them was as badly rusted as crops are frequently found to be in eastern Canada, which are nevertheless thought to be worth cutting for grain.

In passing through the Territories and Manitoba in the second week of August, although the crop was rather late and green, I saw no appearance of rust, nor did I hear any complaints of its occurrence at that time. The first reports were received about the 20th August. Early in September several items in the newspapers showed that there was much anxiety as to the extent of the loss which might occur. The localities where most harm was done, were in the Red River valley, in south-western Manitoba and in eastern Assiniboia. In the Regina district a few crops are said to have been so badly rusted that they were burned. The rust in these fields appears to have been noticed on the leaves and heads about the middle of August. On the 18th of that month there was a hailstorm, accompanied by rain; and immediately afterwards the rust spread rapidly.

In Manitoba, for fear of further injury, some crops of wheat were cut too green to be of use for grain, or were made into hay. Under the circumstances, and, as the season turned out, this was a wise course; for it has been found by Mr. Shutt, the Chemist of the Experimental Farms, that straw attacked by rust makes far better feed for stock even than clean straw, because the presence of the parasite causes the retention in the straw of the nutritious principles which after the seeds are formed are transferred from the straw into the grain.

THE EFFECT UPON THE WHEAT PLANT.

The physiological effect upon the wheat plant by the presence of the rust parasite is better understood by a consideration of the life history of the minute plants which are known as rusts. The term Rust, as applied to cereals, describes a disease due to the attacks of several different parasitic fungi belonging to the Uredineæ, a family which includes the most destructive parasites of cultivated and wild plants; and it must not be forgotten that rust is a plant, and, although so minute that a strong microscope is required to examine it, it is just as much a true plant with a definite life history of its own, as the wheat, oats, grasses, &c., upon which it grows.

The general belief that rust comes with rain, fog, or heavy dew after a hot day, is in the main correct; but the moisture and hot air are not actually the cause of the trouble; they merely act as the carriers of it and provide the conditions necessary for its injurious propagation.

The rust which was answerable for nearly all the injury in the West last season, was the Black Stem Rust. There are about a dozen different kinds of rusts which occur on wheat, oats and barley in this country. The commonest of these are the Orange Leaf Rust (*Puccinia rubigo-vera*) or Spring Rust, and the Black Stem Rust (*Puccinia graminis*), or Summer Rust, which attack all kinds of small grains, and the Crown Rust, or Orange Leaf Rust, of oats *(Puccinia coronata)*, which does not occur on wheat or barley. Each of the first two named species has distinct specialized forms which attack wheat, oats and barley and some other grasses, but which very seldom infest plants belonging to other grains than those upon which they developed. For instance, spores of the Black Stem Rust of wheat will not produce readily on either barley or oats the corresponding rusts of those plants and *vice versa*. The two common rusts of wheat occur in all parts of the world, where that staple crop is grown; and in almost every instance it has been found that the Black Stem Rust is by far the more injurious of the two. The Orange Leaf Rust appears earlier in the season and is the more conspicuous; but the later-developed Black Stem Rust attacks its host in a much more vulnerable spot, namely on the stem, the channel up which the nutritious principles are carried from the vegetative system of the plant to be stored up in the seed. Developing on the stem, it arrests and feeds upon these important elements, thus causing starved and shrunken grain. The Orange Leaf Rust of oats is a different species from the Orange Leaf Rusts that occur on the other small grains; and like them has a red rust or spring form and a dark-coloured or summer form; but the Black Stem Rust of oats is merely a specialized form of the species (*Puccinia graminis*), which is also found on wheat, barley and rye, as well as on many different kinds of grasses.

THE GROWTH OF THE PARASITE.

In the case of the Black Stem Rust, the growth of the parasite is the same, whatever its host plant may be. It passes the winter in a resting condition on the old stems of the previous year. In the fields this will be chiefly on the stubble. The winter-spores or seed-bodies germinate early in spring and produce another kind of spores, which are exceedingly light, and are borne from place to place by the faintest breath of wind. These, alighting on the growing grain plants, produce, later, what is known as the red-rust or uredo stage of the fungus, to be followed in autumn by the resting winter-spores of Black Stem Rust. The sequence of this development is as follows: As soon as the minute spores of the first germination are carried on to a leaf of a growing plant, they germinate and throw out very slender tubes, which enter the tissues of the host plant in the same way that roots penetrate the soil. Here they feed at the expense of their host, and in time produce large numbers of reddish brown spores, which burst through the tissues and cause the red-rust stage, which again, later on in the season, is followed by the black-rust stage, which consists of the pro-

fuse production of another kind of spores, brownish black in colour. These are the teleutospores, and are the means of carrying the parasite over the winter. These black winter-spores frequently appear in this species in the same spots on the stem, where the red-rust stage was earlier in the season, but do not germinate until the following spring.

RUST AND THE BARBERRY.

In addition to these two forms of the Black Stem Rust, there is another stage which has been the subject of much controversy. This comes from the spores of the first generation in spring falling upon the leaves of some species of barberry, where they give rise to a curious fungus, known as Barberry Cluster-cup. After a time this matures and pours out enormous numbers of spores which are carried in all directions by the air and fall upon grain plants, where they give rise to Red Rust. Strange to say, this remarkable fact in the life history of rust was discovered very many years ago, and laws looking to the extermination of the barberry plant date back to 1660, when an Act having this object in view was passed in France.

It is not, however, absolutely necessary for Rust to have its first stage on the barberry, although experiments have shown beyond doubt that it does sometimes occur on that plant. The theory has been advanced that growing in this way in one of its stages on the barberry gives the parasite greater vigour; but it is beyond question that the Black Stem Rust can continue to grow in localities where no barberries are grown, and it is also known to occur in specialized forms on many of the wild prairie grasses. Among the samples of grasses sent to me from Manitoba with the rusted wheat, were specimens of the Skunk-tail grass, or Squirrel-tail (*Hordeum jubatum*), which bore well developed pustules of Black Stem Rust, similar to those which occur on wheat and cultivated barley. The Skunk-tail grass is a very bad weed of the West, and certainly increases in hay lands, owing to a habit farmers have of leaving this grass uncut when mowing, so that it ripens and distributes its seeds. If it were cut down at the same time as hay, the unripe seeds would soon dry up, or might be easily burnt after the hay was carried. Mr. Mark A. Carleton, Cerealist of the United States Bureau of Plant Industry, who has made extensive investigations of rusts, writes as follows:—

'It is positive now from experiments made by this department that the Rust of *Hordeum jubatum* will easily transfer to wheat and barley, and therefore it would decrease the chance of infection of a wheat field, if this grass could be kept out of the wheat, or if the wheat were sown away from its influence.'

REMEDIES.

Little can be done as a remedy against rusts; but, as the parasite passes the winter on the old straw, land left for seeding on stubble should be burnt over carefully before seeding, and the ploughing down of stubbles for summer-fallow should be done as early as possible in the season, so as to prevent as much as may be the distribution of the first generation of spores. Rusted straw fed to cattle is said to distribute the fungus in grain crops from the spores being carried through with the manure. Fresh manure, therefore, should not be used in fields where grain is to be grown. The investigations which have been carried on in Australia, have run largely towards the discovery of varieties of grain which may be more or less exempt from the attacks of rust. Although probably no variety has yet been found entirely free from these parasites, still much has been learned as to the comparative immunity of some kinds, and Mr. Carleton points out that the investigations are said incidentally to have resulted in Australia now having varieties of wheat which are vigorous, true to name, and of exceptional quality for the particular region in which they are grown.

Ever since the institution of the Experimental Farms, much attention has been paid in our experiments with cereals to the problem of rust-resistance. Seed grain has been obtained from all parts of the world. The Australian and many other varieties said to be of special quality have been secured and experimented with, with a view to ascertaining the rust-resisting power of each. A vast amount of useful information will be found by looking through the annual reports of the Experimental Farms, where in the tables of yields of varieties, a special column is devoted each year to the amount of injury by rust on every variety of wheat and oats grown at the different Branch Farms. The result of these experiments, as stated above, is that no variety of wheat or oats, so far, has been found which is perfectly free from rust, although by constant selection those varieties are being separated, which have the greatest power to resist the attack of the parasites.

It may be mentioned here that up to the present time experiments in spraying grain fields with Bordeaux mixture and other fungicides for the prevention of rust have not been attended with any success.

ENCOURAGING FEATURES.

There are some features of the rust epidemic of 1904 which may well be borne in mind by western farmers.

1. The extent of injury this year was much influenced by the unusual season, owing to which all crops were later than usual. The spring was late, cool and dry, followed by hot weather, which suddenly changed at harvest time to dull, wet weather of long duration. The result of these conditions was that, at the time when wheat and oats should have been ready to cut, which was the exact time when the rust appeared this year, not only were grain crops in an exceptionally late and succulent state, but the atmospheric conditions, which were very unusual for the region, were just such as would allow of the rapid development of parasitic fungi.

2. Such an extensive outbreak of rust is without any precedent in the history of the Canadian West.

3. As in ordinary seasons rust has been almost unknown in the West, such extensive injury as was experienced in 1904, must be considered as exceptional and not likely to occur again for many years.

J. FLETCHER.

PERMANENT PASTURES.

The following table gives the yields from the permanent pasture experimental plots for the past four years:—

Number.	Seed sown per Acre. — Mixtures Nos. 1-17, sown May 4, 1901. Sainfoin, No. 18, sown May 1, 1903.				Cured Hay, per Acre.				
					1904.		Total.		
	Grasses.		Clovers.		June 24.	August 12.	1904.	1903.	1902.
		Lbs.		Lbs.	Tons. Lbs.	Tons. Lbs.	Tons. Lbs.	Tons. Lbs.	Tons. Lbs.
1	Timothy Meadow Fescue Orchard Grass Kentucky Blue Red Top	6 4 2 1 1	Alfalfa Alsike Mammoth Red Common Red White Dutch	2 2 1 1 2	3 880	2 3	5 883	4 520	4 40
2	Meadow Fescue Timothy Canadian Blue Orchard Grass Red Top	6 3 2 3 3	Alfalfa Alsike White Dutch	4 1 1	3 960	2 101	5 1,061	3 1,560	4 660
3	Timothy Awnless Brome Orchard Grass	5 4 2	Alfalfa Alsike	6 3	3 1,021	1 1,320	5 341	4 770	5 120
4	Meadow Fescue Orchard Grass Kentucky Blue	6 2 1	Common Red Alfalfa White Dutch	4 3 1	3 1,079	1 1,381	5 460	4 320	5 1,520
5	Timothy Upright Brome	6 4	Alfalfa Mammoth Red	6 4	3 1,282	1 1,339	5 621	4 840	4 960
6	Timothy	10	Common Red	6	3 880	1 840	4 1,720	2 880	4 760
7	Timothy	10	Mammoth Red	6	3 120	1 520	4 640	1 1,520	3 1,200
8	Orchard Grass	18	Alsike	5	1 1,680	1,892	2 1,572	2 80	2 1,200
9	Orchard Grass	18	Common Red	8	2 360	1 160	3 520	2 1,600	3 1,280
10	Meadow Fescue	20	Common Red	8	2 240	1,997	3 237	2 680	3 40
11	Timothy	12	Mammoth Red	8	2 1,980	1,942	3 1,922	2 1,400	3 1,760
12	Timothy	12	Common Red	8	3 320	1 70	4 390	2 1,920	3 20
13	Timothy Awnless Brome	5 10	Common Red Mammoth Red	5 5	2 1,840	1 1,240	3 1,080	2 1,840	4 300
14	Awnless Brome	25	....		1 1,881	840	2 721	1 1,360	3 1,020
15	Awnless Brome	15	Common Red	8	2 1,889	1 320	4 209	3 360	4 760
16	Timothy	8	Mammoth Red	8	3 1,652	1 129	4 1,781	3 1,160	3 340
17	....		Sainfoin	40	3 1,998	2 1,400	6 1,398	4 1,160	3 1,160
18	....		Alfalfa	15	2 840	1 837	3 1,677		

REPORT OF THE EXPERIMENTALIST.

(CHAS. E. SAUNDERS, B.A., Ph.D.)

DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith, the second annual report of the Division of Cereal Breeding and Experimentation.

The cross-fertilising and the selecting of desirable types among cereals occupied much time during the early summer; and, the comparative study of the different varieties of cereals, field roots, &c., as they reached maturity, was the chief work of the later part of the season.

Some attention was also given, during your absence on your annual visit to the branch farms, to the new varieties of hardy, hybrid crab-apples which are being produced for the northern parts of the Dominion.

Good progress has been made during the year in the enlargement of the museum collection of cereals, which is proving of great value.

In the month of December, 1903, I attended the first meeting of the American Breeders' Association at St. Louis, where I presented a paper entitled: 'Some Observations on Heredity in Wheat.'

On the same trip, visits were paid to some of the wheat-testing laboratories in Chicago, Minneapolis and Brookings (South Dakota). Much kindness was received from Prof. Jas. H. Shepard of the South Dakota Experiment Station, who explained in detail the methods used by him in his studies on the milling qualities of the macaroni wheats.

During the winter, much time was spent in the careful study of a large number of selected heads of wheat and other grains for the purpose of starting improved strains of some of the most important varieties. Hand selection of threshed grain from the plots of some of the best sorts of wheat, in order to eliminate certain undesirable types of seed, has also been carried on; while the whole of the grain for the experimental plots was, as usual, carefully hand picked before being sown.

The purchase of a roller-process flour mill for the grinding of small quantities of wheat has enabled me to commence an investigation into the quality of Canadian wheats.

I am much indepted to Mr. George Fixter, for his valuable work as foreman in charge of the experimental plots, and to Miss M. Hager, for the great care with which she performed the work of seed selection in the difficult cases which were entrusted to her.

I am indebted also to Professor C. A. Zavitz, of Guelph, for seed of a strain of Early Yellow Soja beans, to Professor J. H. Shepard of Brookings, for an excellent sample of macaroni made at the South Dakota Experiment Station, to the Sheffield-King Milling Company of Faribault, Minn., for a large sample of patent flour made from macaroni wheat (which proved very good for bread making), to the Lake of the Woods Milling Company and to the Ogilvie Flour Mills Company for fine samples of the products of their mills, to the United States Department of Agriculture for some new varieties of barley, to Mr. C. Boije of Finland, for new sorts of oats, and to Mr.

A. McMullen of the Guinness Laboratories, Dublin, for some extremely interesting samples of Irish barley.

I have the honour to be, sir,

Your obedient servant,

CHARLES E. SAUNDERS,

Experimentalist.

CROSSING OF CEREALS.

Owing to the fact that so many cross-fertilised seeds were obtained in 1903, it was not deemed desirable to devote quite so much attention to this part of the work this year. A smaller number of crosses was therefore attempted, but most of these were of unusual interest. The results were quite satisfactory. The work of cross-fertilising was begun on June 20 and continued until July 6. Eleven different crosses were accomplished in wheat, giving 85 seeds, four in barley giving 28 seeds, and one in oats giving one seed. Some mixed crosses (wheat with barley) were also attempted but the seeds obtained were not plump and may not germinate when planted.

The cross-fertilised seed produced in 1903 was sown on April 25. In no case were the seeds put in closer than 4 inches apart each way. This allowed space for the study of each plant by itself. The oats, barley and peas were sown at greater distances apart. Most of the seed germinated well. The following figures give the number of plants harvested: Peas, 20; wheat and emmer, 416; barley, 18; oats, 4. This makes a total of 458 new varieties of grain. Most of these made very strong growth, many of the plants of wheat attaining a height of nearly five feet. The unusual severity of rust, however, very materially reduced the yield of grain. Nevertheless, if the seed germinates well next season, it should give several thousand new varieties; for experience has shown that every seed from an original cross-bred plant produces a new variety of grain.

SELECTION OF PROMISING TYPES OF CEREALS.

The selection of the most promising types from mixed seed found in commerce and from the newer cross-bred sorts produced at this Farm was continued this year with unusual care. Altogether nearly 300 selected strains were sown, and of these about 200 were harvested, a number of them having been rejected during the growing season on account of their lateness or for some other cause. Among these new strains are several very promising types, which are sufficiently distinct to be ranked as new varieties. The best of these will be brought into the uniform test plots as soon as possible.

The cross-bred varieties of wheat described in the report for last year (Preston, Stanley, Huron, Percy and Laurel) were subjected to very careful re-selection, sufficient seed being obtained in each case to sow the one-fortieth acre plot. This has now given a small stock of grain, greatly improved in character, to serve as the foundation for improved strains of these varieties. Early Riga, Downy Riga, Riga and Bishop were also re-selected in a similar manner. White Fife, a variety seldom met with in a condition at all approaching purity, was also treated in the same way

RUST-RESISTING VARIETIES.

Rust in cereals has attracted more than the usual amount of attention during the past season, the damage from this disease having been greater in some sections of the

country than is generally the case. It seems desirable, therefore, to call attention to the efforts which have been and are being made at the Dominion Experimental Farms to discover rust-resisting varieties of cereals. For many years careful notes have been made at the Experimental Farms on the extent to which each variety of grain has suffered; and this information has been published in the tables in the annual reports. Many new sorts of cereals (especially wheat) have been obtained from Europe, Asia, Northern Africa, the United States and Australia in the search for rust-resisting sorts. In addition to these, many cross-bred varieties have been produced at this farm (by crossing ordinary wheats with macaroni wheats and wheats with emmers) in the hope of obtaining exceptionally strong types. A careful study of single plants of certain varieties is also being carried on, to see whether individuals can be found to be used as the mother plants of rust-resisting strains.

These lines of investigation have not yet been followed long enough to reach very striking results, but the work is being continued on a larger scale than before.

DESCRIPTION OF CROSS-BRED VARIETIES OF WHEAT.

The following new varieties of wheat produced at this farm are here described for the first time. They are all being propogated as rapidly as possible, but are not yet available for general distribution. It should be noticed that Early Riga, Downy Riga, Riga and Bishop are valuable chiefly on account of their earliness. They are not recommended for cultivation in districts where the ripening season is long.

The measurements given in the descriptions apply to the grain as grown at Ottawa.

Early Riga.—Parentage, Gehun (female) crossed with Onega (male). Kernels red, rather small. Heads beardless, rather small, usually about 3 inches long. Chaff yellowish, smooth and downy mixed. Straw stiff, but not above medium height, usually about 42 inches long. Ripens very early, about 12 days before Red Fife. Gives a rather small yield, especially in seasons when rust is unusually severe. Makes excellent flour.

As this variety is a mixture of two distinct types, easily distinguished by the hairiness or smoothness of the chaff, it has been separated into the two varieties described below.

Downy Riga.—Obtained from Early Riga by selection of the heads having downy chaff.

Riga.—Obtained from Early Riga by selection of the heads having smooth chaff.

Bishop.—Parentage, Ladoga (female) crossed with Gehun (male). Kernels yellowish, of about medium size. Heads beardless, usually about 3½ inches long, rather blunt. Chaff yellowish, smooth. Straw moderately stiff, usually about 43 inches long. Ripens quite early, about 8 days before Red Fife. Gives a fair yield. Makes very good flour. This variety resembles White Fife in some respects, but is distinguished by its rather blunt head, its much greater earliness and its somewhat smaller yield. (White Fife usually ripens with Red Fife).

Red Preston.—The original Preston wheat gave two types of heads, some having yellowish chaff and others red chaff. The name Preston is now being used to designate only the type with yellowish chaff, as described in the Report of the Experimental Farms for 1903, page 219. The name Red Preston is given to the type having red chaff. In other respects Red Preston resembles Preston.

DOUBLE ROWS AND OTHER SMALL PLOTS OF CEREALS.

Well-known varieties of cereals which have been rejected from the uniform test plots as undesirable for general cultivation are retained for reference purposes and are grown annually in the double rows. These rows are 33 feet long and about 6 inches apart; and each pair of rows is separated from the neighbouring pairs by a space of

about 2 feet. In these double rows are also sown all the new varieties of grain, of which there is only a very small quantity of seed on hand. When a larger amount of seed is available a small plot is sown, but the yield per acre is not usually estimated when the plot is less than one-fortieth of an acre in extent.

An alphabetical list of the principal varieties grown in the double rows and other small plots, during the past season, is here given. The total number of these was 157. Those sorts which are given under letters and numbers are new varieties produced at this farm, but not yet named.

Spring Wheat.

6 B 2 (Red Fife × Polish).
6 E " "
6 T " "
7 D (Red Fife × Roumanian).
7 E " "
8 C (Red Fife × Goose).
8 E " "
8 H 1 " "
9 A 1 (Common Emmer × Colorado Wheat).
9 D 1 " "
9 D 2 " "
9 G " "
9 H 1 " "
9 K 2 " "
10 C (Colorado Wheat × Common Emmer).
10 F " "
Alpha.
Banat.
Bearded March.
Beaudry.
Campbell's White Chaff.
Cape.
Cartier.
Cassel.
Chiddam March.
Club.
Crown.
Early Sonora.
Galician.
Gurke.
Herisson Beardless.
Hungarian Mountain.
Hungarian Red.
Hungarian White.
Japanese.
Japhet.
Ladoga.
Naples.
Norval.
Persian Black.
Pringle's Defiance.
Progress.
Red Bearded.
Red Preston.
Red Swedish.
Rideau.
Robin's Rust Proof.
Rye Wheat.
Sicilian.
Strubes.
Summer Cob.
Touzelle.
Victoria.

Macaroni or Durum Wheat.

Adjini Red.
Adjini Yellow.
Arneutka,
Italian.
Madonna.
Mahmoudi Red.
Mahmoudi Yellow.
Mishriki.
Polish.
Red Indian.
Sleaford.
Sorentino.

Emmer and Spelt.

Black Bearded Spelt.
Double Emmer.

Oats.

Abyssinia.
Aitken Black.
Australian.
Bayonet.
Bergs (black).
Beseler.
Black Mesdag.
Bonanza.
Brandon White.
Brandon Yellow.
Brown Algerian.
California Prolific (black).
Clydesdale.
Cream Egyptian.
Cromwell.
Dinauer.
Doncaster Prize.
Early Archangel.
Early Blossom.
Early Gothland.
Early Maine.
Eureka.
Fichtel Mountain.
Flying Scotchman.
Holland.
King.
Leutenwitzer.
Liberty.
Miller.
Newmarket.
New Zealand.
Norwegian Black.
Oderbruch.
Prince Royal.
Rennie's Prize White.
Russell.
Salines.
Scarboro.
Scottish Chief.
Selchower.
Sheffield Standard.
Tobolsk.
Tunis (brown).
Victoria Prize.
White Russian.
White Schonen.
White Wonder.
Zhelannii.

Six-row Barley.

Blue Short Head.
Excelsior.
Foyston.
Hulless White (beardless).
Petschora.
Phœnix.
Small Blue Naked.
Success (beardless).
Surprise.
Vanguard.

Two-row Barley.

Black Two-row.	Improved Thanet.	Nepean.
Duckbill.	Italian.	Prize Prolific.
Erfurt White.	Jewel.	Rigid.
Gambrinus.	Kinver Chevalier.	Triple Naked (beardless).
Hofbrau.	Large Naked.	Victor.

Peas.

Alma.	Elephant Blue.	New Potter.
Bright.	Fergus.	Norwegian Grey.
Bruce.	French Canner.	Oddfellow.
Centennial.	Harrison's Glory.	Perth.
Creeper.	Maple.	Trilby.
Elder.	Multiplier.	

UNIFORM TEST PLOTS OF CEREALS, FIELD ROOTS AND FODDER CORN.

The standard and new varieties of cereals which are obtainable commercially are annually grown in plots of one-fortieth of an acre, along with the cross-bred sorts produced at the Farms and a number of other varieties obtained from various sources. The field roots and fodder corn are grown in similar plots, and the yield per acre is estimated from the crop obtained from two rows, each 66 feet long. The object of these tests is to determine the relative productiveness, earliness, &c., of the different varieties. Those which for a series of years are found to be distinctly inferior are rejected, and strong efforts are made to keep the list within as small bounds as possible without omitting anything which may ultimately prove of value.

The number of these larger plots grown during the past season was as follows:—Spring wheat, 98; macaroni wheat, 14; winter wheat, 20; emmer and spelt, 11; oats, 80; six-row barley, 47; two-row barley, 28; winter barley, 1; pease, 34; spring rye, 1; winter rye, 4; soja beans, 3; horse beans, 2; field beans, 4; flax, 7; turnips, 40; mangels, 32; carrots, 20; sugar beets, 16; Indian corn, 50; mixed grain, 8; making a total of 520 plots. These represent about 410 varieties, duplicate plots being necessary, for special reasons, in some cases.

Some of the varieties mentioned in the Report of the Experimental Farms for 1903, have been discontinued on account of lateness, small yield, or for other defects.

PREPARATION OF LAND FOR THE UNIFORM TEST PLOTS.

The system of cultivation adopted for the land devoted to the experimental plots is necessarily somewhat different from that which is generally considered advisable in ordinary farming; but it is worthy of mention that abnormally large quantities of fertilising material are not employed. The land used for the plots consists of three separate fields, and a three-year rotation is practised. Each field receives every third year a dressing of fresh barn-yard manure. This has been applied in the past at the rate of only twelve tons per acre, but this amount has been found insufficient whenever the manure has not been of the highest strength. The quantity is therefore being increased to 18 tons per acre. This is at the rate of 6 tons per acre for each year. While this is a somewhat larger quantity of barn-yard manure than is used in ordinary farming, it must be remembered that there is no opportunity in this case for the ploughing under of sod or for allowing the land to be used sometimes for pasture, as is the common practice. For these reasons it seems necessary to apply the manure in somewhat greater quantities than usual, though it cannot be fairly claimed that the land is unduly enriched by this method. The manure is spread on the ground and ploughed under in spring. This field is then used for roots, fodder corn and other hoed crops. In the autumn, after the harvest is over, the land is ploughed about seven inches deep, and is left in that condition until the following spring, when it is cultivated twice with a two-horse cultivator and harrowed twice with a smoothing harrow. Cereals are then sown. After the grain is harvested the land is ploughed about three or four inches deep, to start the shed grain and any weed seeds present, and is again

ploughed a few weeks later about seven inches deep. In the following spring it is prepared as before and cereals are again sown. It is not, however, the practice to sow the same cereal twice in succession on the same piece of land.

SELECTION OF SEED FOR UNIFORM TEST PLOTS.

In order to obtain the seed for the uniform test plats in the best condition, and as nearly as possible in a state of absolute purity, selected heads are gathered by hand from each plot just before the grain is cut. About eight pounds of heads are harvested in this way. During the winter these selected samples are carefully threshed and cleaned by hand; and the grain to be sown the next season is thus brought to a very high standard of purity. This method has been used for several years with wheat and barley; and is being continued with these grains. In oats, however, the selection of heads is not usually carried out unless the grain in the plot shows signs of being mixed. It is much more difficult to select the heads of oats; and the plots are always injured more or less while the work is being done, on account of the growth of the oats being very thick.

In all cases, when the seed for the plots is not obtained by hand selection in the field, the crop from the plot is thoroughly screened and carefully hand-picked before being sown the next season.

WEATHER.

Spring opened late, but the rather unusually cool weather during the month of May gave ample opportunity for the root growth of cereals wherever the seed had germinated well. On some soils, however, the crops made poor progress during this month. June and July were favourable months, but August and September were wet and rather cold. On the whole the season was a good one, except for the unusual severity of rust on cereals. Late-maturing varieties and all plots sown rather late suffered most, wheat being in some cases badly shrivelled in consequence.

SPRING WHEAT.

The following varieties of spring wheat were added to the plots this season :—

Riga.—See 'Description of Cross-bred Varieties of Wheat.'

Downy Riga.—See 'Description of Cross-Bred Varieties of Wheat.'

Pearl.—This is a beardless wheat with large, round, red kernels. It was obtained from Sweden. It proved late in ripening and suffered severely from rust.

Saumur.—Obtained from France under the name of *Saumur de Mars.* The kernels of the imported grain were rather large, red and soft. It gave a very poor yield this season.

Two other sorts, *Pilhiviers* and *Red Prolific,* obtained from France, proved entirely unsuited to our conditions.

Several varieties have been dropped from the uniform plots this year. Only one of these, however, is of importance : the variety known as White Connell. A careful study showed that White Connell is an impure strain of White Fife. It was, therefore, rejected.

All kinds of wheat were affected by rust this season, but the injury was most severe in the case of those varieties which were late in ripening, whether the lateness was due to a delay in sowing or to the habits of the varieties. The results this year serve to emphasise most strongly the importance of early sowing for wheat.

The sowing of the wheat plots was begun on April 27, but owing to unfavourable weather, was not completed until May 2.

All the plots were one-fortieth of an acre, except in the case of Pearl, where the amount of seed on hand was only sufficient for one-eightieth of an acre.

The seed was used at the rate of 1½ bushels to the acre.

The yield per acre is expressed in 'bushels' of 60 pounds.

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs.	
1	Byron*	Aug. 1	96	39 to 41	Stiff	$3\frac{3}{4}$ to $4\frac{1}{4}$	27	20	63	Badly.
2	Australian No. 28	" 10	100	44 " 46	"	$3\frac{1}{2}$ " $4\frac{1}{4}$	27	20	60	"
3	Newdale*	" 3	93	45 " 47	"	$3\frac{1}{2}$ " 4	26	20	61	Slightly.
4	Weldon*	" 9	99	44 " 46	"	$3\frac{1}{2}$ " 4	26	20	$59\frac{1}{4}$	Badly.
5	Australian No. 21	" 10	100	43 " 45	"	$3\frac{3}{4}$ " $4\frac{1}{4}$	25	40	$60\frac{1}{2}$	"
6	Hastings*	" 2	97	42 " 44	"	3 " $3\frac{3}{4}$	25	20	62	"
7	Admiral*	" 5	95	41 " 43	"	$3\frac{1}{2}$ " 4	25	..	$61\frac{3}{4}$	"
8	Spence*	" 4	94	47 " 49	"	$3\frac{1}{2}$ " 4	24	40	$63\frac{1}{2}$	"
9	Bishop*	" 1	91	36 " 38	"	3 " $3\frac{1}{2}$	24	40	$62\frac{1}{2}$	Slightly.
10	Chester*	" 3	93	39 " 41	"	$3\frac{1}{2}$ " 4	24	40	$61\frac{1}{4}$	Considerably.
11	Australian No. 12	" 9	99	45 " 47	"	$3\frac{1}{2}$ " 4	24	20	$61\frac{1}{2}$	Badly.
12	Benton*	" 4	99	43 " 45	"	$3\frac{3}{4}$ " $4\frac{1}{4}$	23	40	$60\frac{1}{4}$	"
13	Advance*	" 4	99	40 " 42	"	$3\frac{1}{2}$ " $4\frac{1}{4}$	23	40	$61\frac{1}{2}$	Considerably.
14	Redpath*	" 9	99	48 " 50	"	$3\frac{1}{2}$ " $4\frac{1}{4}$	23	40	59	Badly.
15	Nixon*	" 4	99	42 " 44	"	$3\frac{1}{4}$ " $3\frac{3}{4}$	23	20	60	Considerably.
16	Herisson Bearded	" 4	99	39 " 41	"	$1\frac{3}{4}$ " $2\frac{1}{4}$	23	..	$63\frac{1}{2}$	Badly.
17	Orleans*	" 4	99	44 " 46	"	$3\frac{3}{4}$ " $4\frac{1}{2}$	23	..	$60\frac{1}{4}$	Considerably.
18	Plumper*	" 3	93	39 " 41	"	$3\frac{1}{2}$ " $4\frac{1}{4}$	23	..	$63\frac{1}{2}$	Badly.
19	Red Fern	" 8	98	43 " 45	"	$3\frac{3}{4}$ " $4\frac{1}{4}$	22	40	$61\frac{1}{2}$	"
20	Dawson*	" 9	99	48 " 50	"	$3\frac{3}{4}$ " $4\frac{1}{2}$	22	20	$59\frac{1}{2}$	"
21	Preston*	" 2	97	38 " 40	"	$3\frac{1}{4}$ " 4	21	20	$61\frac{1}{2}$	Considerably
22	Laurel*	" 8	98	42 " 44	"	$3\frac{1}{4}$ " 4	21	20	$56\frac{1}{2}$	Badly.
23	Clyde*	" 8	98	41 " 43	"	$3\frac{1}{2}$ " $4\frac{1}{4}$	21	..	60	"
24	Crawford*	" 2	92	38 " 40	"	$3\frac{1}{2}$ " 4	20	20	$61\frac{1}{2}$	Slightly.
25	Countess*	" 3	93	44 " 46	"	$3\frac{1}{4}$ " 4	19	40	$61\frac{1}{4}$	Badly.
26	Colorado	" 3	93	42 " 44	"	3 " $3\frac{3}{4}$	19	40	62	Considerably.
27	Ebert*	July 28	92	38 " 40	"	$3\frac{1}{4}$ " $3\frac{3}{4}$	19	20	62	"
28	Pringle's Champlain	Aug. 3	98	38 " 40	"	$3\frac{1}{2}$ " $4\frac{1}{4}$	19	..	61	Badly.
29	Dayton*	July 30	94	40 " 42	"	3 " $3\frac{3}{4}$	19	..	$61\frac{1}{4}$	"
30	Monarch	Aug. 8	103	38 " 40	"	$3\frac{1}{2}$ " 4	18	40	60	Considerably.
31	Dawn*	" 4	99	42 " 44	"	$3\frac{1}{2}$ " $4\frac{1}{4}$	18	20	$59\frac{1}{2}$	"
32	Percy*	" 2	97	36 " 38	"	3 " $3\frac{3}{4}$	18	..	61	"
33	White Fife	" 9	99	40 " 42	"	$3\frac{1}{4}$ " 4	18	..	60	Badly.
34	Downy Riga*	July 28	92	39 " 41	"	$2\frac{3}{4}$ " $3\frac{1}{4}$	18	..	60	"
35	Gehun	July 29	93	40 " 42	Medium	$2\frac{1}{2}$ " $3\frac{1}{4}$	17	40	60	Considerably.
36	White Russian	Aug. 8	103	40 " 42	Stiff	$3\frac{1}{2}$ " 4	17	..	60	Badly.
37	Early Riga*	July 28	92	39 " 41	"	$2\frac{3}{4}$ " $3\frac{1}{4}$	17	..	60	"
38	Stanley*	Aug. 2	97	36 " 38	"	3 " $3\frac{3}{4}$	16	40	$58\frac{1}{2}$	Considerably.
39	Fraser*	July 29	93	35 " 37	Medium	$2\frac{3}{4}$ " $3\frac{1}{4}$	16	40	$60\frac{3}{4}$	"
40	McKendry's Fife (Minn. 181)	Aug. 9	99	42 " 44	Stiff	$3\frac{1}{2}$ " $4\frac{1}{4}$	16	40	59	Badly.
41	Australian No. 19	" 9	99	35 " 37	"	$2\frac{3}{4}$ " $3\frac{1}{4}$	16	40	$60\frac{1}{2}$	"
42	Rio Grande	" 7	97	46 " 48	"	$4\frac{1}{4}$ " 5	16	20	$59\frac{1}{2}$	"
43	Power's Fife (Minn. 149)	" 9	99	37 " 39	"	3 " $3\frac{3}{4}$	16	20	61	"
44	Minnesota No. 163	" 11	101	43 " 45	"	$3\frac{1}{2}$ " $4\frac{1}{4}$	15	40	$58\frac{1}{2}$	"
45	Australian No. 15	" 10	100	33 " 35	"	$3\frac{1}{4}$ " $3\frac{3}{4}$	15	40	$60\frac{1}{2}$	"
46	Riga*	" 1	96	37 " 39	"	$2\frac{3}{4}$ " $3\frac{1}{4}$	15	20	60	Considerably.
47	Australian F	" 8	98	36 " 38	"	$3\frac{1}{4}$ " 4	15	20	$59\frac{1}{2}$	Badly.
48	Red Fife	" 8	103	37 " 39	"	$3\frac{1}{4}$ " 4	15	..	60	"
49	Harold*	July 28	92	37 " 39	"	$2\frac{3}{4}$ " $3\frac{1}{4}$	15	..	60	"
50	Marvel	Aug. 3	93	39 " 41	"	$3\frac{1}{2}$ " 4	14	40	59	Considerably.
51	Wellman's Fife	" 8	103	40 " 42	"	$3\frac{1}{2}$ " 4	14	20	$56\frac{1}{2}$	Badly.
52	Blue Stem	" 13	103	46 " 48	"	$3\frac{1}{2}$ " $4\frac{1}{4}$	14	20	$57\frac{1}{2}$	"
53	Hungarian	" 7	102	37 " 39	Medium	3 " $3\frac{3}{4}$	14	.	61	"
54	Pearl	" 17	107	48 " 50	Stiff	$3\frac{3}{4}$ " $4\frac{1}{4}$	13	20	55	"
55	Tracey*	" 9	104	40 " 42	"	$3\frac{1}{4}$ " $4\frac{1}{2}$	12	40	58	Considerably.
56	Haynes' Blue Stem (Minn. 169)	" 13	103	46 " 48	"	$3\frac{1}{2}$ " 4	12	40	$58\frac{1}{2}$	Badly.
57	Huron*	" 4	99	36 " 38	"	$3\frac{1}{2}$ " 4	12	20	$59\frac{1}{2}$	"
58	Saunur	" 11	101	31 " 33	"	$2\frac{1}{2}$ " 3	12	20	55	"
59	Australian No. 9	" 7	97	36 " 38	"	$3\frac{1}{4}$ " 4	11	20	$56\frac{1}{2}$	"

* Cross-bred varieties produced at the Experimental Farms are marked with an asterisk.

Most Productive Varieties of Spring Wheat.—Excluding the macaroni wheats, which are considered separately, the most productive varieties of spring wheat at this Farm for the last five years have been Preston, Huron, Herisson Bearded and Pringle's Champlain. These are all bearded varieties. Preston, Huron and Pringle's Champlain are of good quality for milling purposes.

The most productive beardless variety, during the last five years, has been White Fife. Red Fife (beardless) and Red Fern (bearded) have also given very good yields; while White Russian (beardless), Laurel (beardless), and Wellman's Fife (beardless) have proved almost equally productive.

Earliest Varieties of Spring Wheat.—The earliest varieties of spring wheat grown in the plots on this Farm are Harold, Ebert, Fraser, Gehun, Early Riga, Riga and Downy Riga. These sorts are not yet available for general distribution, but the best of them will be introduced as soon as possible.

Preston, Stanley and Percy are the earliest kinds which are now being sent out from the Experimental Farms. They ripen at Ottawa about six days before Red Fife.

MACARONI OR DURUM WHEAT.

The term "macaroni" wheat is generally employed to designate those extremely hard varieties with large kernels of which 'Goose' or 'Wild Goose' is the best-known example in Canada. The different sorts of macaroni wheat are by no means identical in quality, but for commercial purposes they are generally considered as practically the same.

They are looked upon with disfavour by millers; and farmers who grow any wheat of this class should exercise great care to prevent it from becoming mixed with wheat which is to be sold for flour-making.

As a rule, these wheats suffer less from drought and from rust than other sorts. They may, therefore, in some cases, be grown to advantage, especially in rather dry districts where rust is apt to be severe. Though these varieties were attacked by rust during the past season at this Farm, it will be noticed that the evil effects of the disease were not nearly so marked as in the case of spring wheats of the ordinary type, the macaroni wheats being higher in yield and in weight per bushel. They are not, however, to be generally recommended for damp climates. It should also be borne in mind that the market price of macaroni wheat is generally lower than that paid for varieties of wheat which are popular for milling purposes.

The plots of macaroni wheat were one-fortieth of an acre in extent. The seed was sown on May 2 at the rate of 1¾ bushels to the acre.

The yield per acre is expressed in 'bushels' of 60 pounds.

Bishop. Riga. Downy Riga.

The photographs show the actual sizes of the heads.

MACARONI WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre. Bush.	Yield per Acre. Lbs.	Weight per measured bushel after cleaning.	Rusted.
				Inches.		Inches.			Lbs.	
1	Roumanian	Aug. 18	108	50 to 52	Stiff	2½ to 3	39	40	63	Considerably.
2	Velvet Don	" 11	101	45 " 47	Medium	2½ " 3	36	20	63¼	"
3	Goose	" 10	100	48 " 50	"	2¼ " 2¾	35	20	63¾	"
4	Gharnovka	" 15	105	48 " 50	Stiff	2¾ " 3¼	35	..	62½	"
5	Black Don	" 10	100	45 " 47	"	2¼ " 2¾	33	..	63	Badly.
6	Yellow Gharnovka	" 15	105	53 " 55	"	2½ " 3	31	20	63	Considerably.
7	Kubanka	" 9	99	49 " 51	Medium	2½ " 3	30	20	63½	"
8	Kahla	" 14	104	41 " 43	"	2 " 2¾	26	20	60½	"
9	Mahmoudi	" 15	105	46 " 48	Stiff	2½ " 3	26	..	59	Badly.
10	Medeah	" 9	99	48 " 50	"	2½ " 3	24	20	59½	Considerably.
11	Beloturka	" 11	101	39 " 41	"	2¼ " 2¾	24	..	64	"

These varieties of macaroni wheat have not been grown long enough to permit the drawing of definite conclusions as to their relative yield and earliness through a series of years. Roumanian can, however, be recommended for its large yield.

POLISH OR CORN WHEAT.

Much attention has lately been given by the public to a variety of macaroni wheat called 'Polish' or 'Polonian' or 'Corn Wheat' or 'Giant Rye.' This wheat is characterized by extremely large, bearded heads and long yellowish kernels, and is altogether very striking in appearance. It has, however, been rejected from the larger test plots at this Farm on account of its uniformly very small yield, and its great susceptibility to rust. During the four years ending in 1903 the following average yields were given by Polish, Goose, Red Fife and Preston wheats :—

	Yield per Acre. Bush.	Yield per Acre. Lbs.
Polish	13	33
Goose	27	3
Red Fife	31	23
Preston	33	55

WINTER WHEAT.

Several varieties of winter wheat which had not previously been tested at this Farm were added to the uniform plots this year. They were all obtained from seedsmen in America (chiefly in Ontario), except the two Russian sorts, Kharkov and Padi, which were kindly furnished by the Department of Agriculture of the United States.

Kharkov (Washington, No. 7786).—This is a bearded variety with rather small heads and with smooth, yellowish chaff. The kernels are red, rather small and unusually hard for winter wheat. This is a very promising variety for flour-making.

Padi (Washington, No. 9129).—This resembles Kharkov in almost every respect except that the heads are beardless.

Abundance, American Banner, Red Chief, Early Windsor, Invincible and *Prosperity* are beardless varieties; and *Silver Sheaf* is a bearded sort.

The plots of winter wheat were sown on September 10, 1903. All the plots were one-fortieth of an acre, and the seed was used at the rate of 1¾ bushels to the acre.

When winter set in the plots were looking well, but when growth commenced in spring many of the plots were thin or bare in some spots owing to winter-killing. In

most cases, therefore, it was deemed advisable to estimate the yield of grain from one-eightieth of an acre only.

The yield per acre is expressed in 'bushels' of 60 pounds.

WINTER WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		No. of Days maturing.	Length of Straw, includ'g Head	Character of Straw.	Length of Head.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
					Inches.		Inches.	Bush.	Lbs.	Lbs.	
1	Red Velvet Chaff	July	23	317	55 to 57	Medium	3-3¾	40	40	61½	Considerably.
2	Turkey Red	"	20	314	50 " 52	Weak	2¾-3¼	39	20	61	"
3	Abundance	"	21	315	47 " 49	Stiff	3½-4¼	39	20	61	"
4	American Banner	"	22	316	56 " 58	"	3¼-3¾	38	40	61	"
5	Kharkov	"	20	314	46 " 48	Weak	2 -2½	38	..	61½	Slightly.
6	Imperial Amber	"	23	317	50 " 52	"	3¼-3¾	37	20	58¼	Badly.
7	Red Chief	"	23	317	54 " 56	Stiff	3 -3½	36	..	60¼	Slightly.
8	Early Windsor	"	27	321	55 " 57	"	3 -3¾	34	40	58½	Badly.
9	Reliable	"	22	316	48 " 50	"	3½-4¼	32	..	63¼	Slightly.
10	Silver Sheaf	"	20	314	55 " 57	Medium	3¼-3¾	30	..	59	Considerably.
11	Invincible	"	22	316	47 " 49	Stiff	3½-4¼	28	40	62½	Slightly.
12	Buda Pesth	"	22	316	45 " 47	"	3 -3½	26	..	62	"
13	Dawson's Golden Chaff	"	23	317	50 " 52	"	3 -3½	26	..	58¼	Considerably.
14	Early Red Clawson	"	22	316	41 " 43	"	2¾-3¼	25	20	61½	"
15	Golden Cross	"	22	316	46 " 48	"	2½-3	25	20	63½	"
16	Surprise	"	25	319	50 " 52	"	3½-4	24	..	56½	"
17	Prosperity	"	23	317	46 " 48	"	3½-4	22	..	62½	"
18	Gold Coin	"	21	315	38 " 40	"	3 -3½	19	20	60½	Slightly.
19	Egyptian Amber	"	25	319	40 " 42	"	3¼-3¾	19	20	59	Badly.
20	Padi	"	27	321	43 " 45	"	3¼-3¾	17	..	59½	"

STUDY OF THE QUALITY OF DIFFERENT VARIETIES OF WHEAT.

Reference was made in last year's report to the fact that the work of testing the quality of different varieties of wheat was being undertaken, and that preliminary tests of most of the valuable sorts of spring wheat had been completed. In view of the great importance of quality in wheat it seemed highly desirable that thorough investigations into this subject should be conducted at this Farm in order both to study existing varieties commonly cultivated, and also to test all the new sorts which might from time to time be produced here, or brought into Canada from other countries.

The purchase of a small roller-process flour mill made by the Allis-Chalmers Company expressly for grinding very small quantities of wheat was therefore approved by the Minister of Agriculture. This mill is now in use, and though the investigations have not, at this date, proceeded very far the great value of the apparatus has already been shown. The mill is provided with two pairs of steel rollers, one pair corrugated and the other smooth. There is also a sifting apparatus supplied with a dozen sieves of different degrees of fineness, from No. 16 wire gauze up to No. 14 bolting cloth.

With such a machine, it is possible to handle, with satisfaction, any quantity of wheat from a few ounces to several pounds, the most convenient amount being about one or two pounds. A good quality of 'straight' flour can easily be produced, sufficiently well purified to enable the experimenter to make satisfactory comparisons between the different varieties of wheat employed. If a more highly purified product is desired it is possible, by taking special care, to obtain 'patent' flour of very high grade.

The flour made by this apparatus is being subjected to chemical and mechanical analysis; and baking tests are also being carried on. The results of this work will be given to the public as soon as possible, with a view to encouraging the sowing (for flour-making purposes) of only those varieties of wheat which will give a product of high quality.

EMMER AND SPELT.

In June of the present year a bulletin was issued on Emmer and Spelt, giving descriptions of the different varieties and some comparisons between these and other cereals in regard to productiveness and chemical composition. It is therefore unnecessary to give such details in this report.

Single Emmer (*Triticum monococcum*) is again at the head of the list this year. Its extreme lateness in ripening is, however, a strong point against it.

Common Emmer ('Speltz') has not proved as productive as some other sorts this year.

Two of the varieties reported upon last year have been dropped from the uniform plots, Ufa Emmer because it proved to be identical with Common Emmer, and Black bearded Spelt because of its very coarse hull and rather small yield.

The plots of emmer and spelt were one-fortieth of an acre. The grain was sown on May 3 at the rate of about 120 pounds per acre.

EMMER AND SPELT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.	Weight per measured bushel after cleaning.	Rusted.
				Inches.		Inches.	Lbs.	Lbs.	
1	Single Emmer	Aug. 28	117	35 to 37	Stiff	2¾ to 3¼	3,060	29½	Slightly.
2	Red Emmer	" 19	108	46 " 48	"	3 " 3½	2,760	36	Considerably.
3	White Emmer	" 19	108	49 " 51	"	3 " 3½	2,540	33	"
4	Smooth Spelt	" 19	108	47 " 49	"	5¼ " 5¾	2,260	26	Badly.
5	Red Spelt	" 20	109	48 " 50	"	4 " 4½	2,240	26½	"
6	Common Emmer	" 12	101	45 " 47	"	2 " 2½	2,040	40	Considerably.
7	Thick Emmer	" 13	102	45 " 47	"	2½ " 3	1,980	34½	"
8	White Spelt	" 15	104	48 " 50	"	4½ " 5¼	1,740	24	Badly.
9	White bearded Spelt	" 12	101	48 " 50	"	4¼ " 5	1,680	24½	"
10	Long Emmer	" 31	120	51 " 53	"	3¼ " 3¾	1,220	22½	Considerably,

OATS.

The varieties of oats added to the experimental plots this season are as follows :—

Daubeney.—This was obtained in commerce in Ontario. It is a white oat with a loose, open head and ripens rather early.

Garton's Abundance.—A white oat with a loose head. Originated by Garton Bros., England. The imported seed was very plump.

Swedish Ligowo.—This is a strain of the well-known Ligowo oat which was obtained from Sweden and is said to be an improvement on the original variety.

Bell.—A black oat obtained from Sweden. The imported seed weighed 40½ lbs. per bushel.

Whiling.—A white oat of about medium size and with a loose head obtained from Sweden. The imported seed weighed 45½ lbs per bushel.

Gold Rain.—A yellow oat of medium size, obtained from Sweden. The imported grain weighed 43 lbs. per bushel. This variety has a rather small, moderately loose head, and ripens early.

Colossal.—A yellow oat with a loose head. Originated by Garton Bros.

Early Angus.—A white oat, obtained from Ireland. This did not give evidence this season of being an early variety.

Tlola.—A black oat from Finland, kindly sent to this Farm by Mr. C. Boije. The seed of this variety was received too late for sowing among the regular plots.

The plots of oats were sown on the 6th of May, all being one-fortieth of an acre except Swedish Ligowo, Bell, Whiting, and Gold Rain, which were one-eightieth. The cold weather in May proved unfavourable for the germination of the seed and for the growth of the young plants, especially in the lower parts of the field on which these plots were situated. Later in the season the oats were severely attacked by rust. The yield from the plots has therefore been somewhat irregular and unsatisfactory. In the case of some of the varieties the yield has been estimated from only one-half of the plot, and in the case of Bavarian, Columbus, Dixon, Golden Fleece, Prolific Black Tartarian, Swedish Select and Wallis, it seemed best not to estimate the yield at all, as it would have been quite misleading.

The yield per acre is expressed in 'bushels' of 34 pounds.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripen-ing.	No. of Days Maturing.	Length of Straw, includ'g Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs.	
1	Lincoln	Aug. 13	99	48-50	Medium	8 - 9	98	8	36½	Badly.
2	Twentieth Century	" 11	97	48-50	Weak	7½- 9	93	18	34½	"
3	Wide Awake	" 13	99	50-52	Medium	8½- 9½	89	14	36	"
4	Garton's Abundance	" 10	96	48-50	"	8¾- 9½	89	14	34½	"
5	Uberfluss	" 11	97	46-48	"	8½- 9¼	87	22	34	"
6	Virginia White Abundance	" 10	96	46-48	"	8¾- 9½	85	30	35	"
7	Milford White*	" 13	99	46-48	Weak	9 -10	85	10	33¼	"
8	Swedish Ligowo	" 10	96	52-54	Stiff	7¾- 9	84	24	39½	"
9	American Triumph	" 13	99	45-47	Medium	7½- 8½	80	20	33½	"
10	Mennonite	" 10	96	43-45	"	7 - 8	79	14	33¼	"
11	Sensation	" 15	101	47-49	"	8¼- 9	77	2	37	"
12	Bestehorn's Abundance	" 10	96	48-50	Stiff	8¾- 9½	77	2	35½	Considerably.
13	Pioneer (black)	" 15	101	37-39	Medium	7 - 8½	76	16	34¾	Badly.
14	Anderbecker	" 12	98	48-50	Stiff	8¼- 9	75	30	37½	"
15	Hazlett's Seizure	" 16	102	45-47	"	9½-10¼	74	4	33	"
16	Holstein Prolific	" 17	103	40-42	Medium	8 - 9	73	18	32	"
17	Kendal Black*	" 15	101	47-49	Stiff	10 -11	72	12	36½	"
18	Early Golden Prolific	" 12	98	44-46	"	8 - 9¼	72	12	33½	"
19	White Giant	" 16	102	45-47	"	9½-10½	71	6	33	Considerably.
20	Golden Beauty	" 13	99	38-40	"	8½- 9	71	6	35	Badly.
21	Abundance	" 10	96	46-48	"	8¾- 9½	71	6	35	"
22	Kendal White*	" 16	102	46-48	"	8½- 9½	70	20	33	"
23	Milford Black*	" 15	101	46-48	"	10 -11	70	20	36¼	"
24	Thousand Dollar	" 11	97	46-48	"	7¾- 8½	70	..	36½	"
25	Irish Victor	" 15	101	44-46	"	8 - 9	70	..	35	"
26	Banner	" 16	102	45-47	"	8½- 9¼	69	14	34	"
27	Pense Black*	" 16	102	44-46	Medium	9½-10½	69	14	35½	"
28	Excelsior (black)	" 11	97	43-45	Stiff	8 - 9	69	14	34¼	"
29	Atlantic	" 9	95	44-46	"	8½- 9½	68	28	37	"
30	Golden Giant	" 19	105	44-46	"	9 -10	67	2	30½	"
31	Great Northern	" 13	99	42-44	"	8 - 9	66	16	33	"
32	American Beauty	" 12	98	45-47	Medium	8½- 9¼	65	10	34¼	"
33	Buckbee's Illinois	" 13	99	36-38	Weak	5½- 6½	64	4	36	"
34	Bell (black)	" 14	100	50-52	Medium	8 - 9½	63	18	30½	"
35	Whiting	" 10	96	44-46	Stiff	8 - 9	60	..	36¾	"
36	Gold Rain	" 9	95	44-46	"	8 - 9	58	28	38	"
37	Scotch Potato	" 17	103	45-47	"	8½- 9½	58	28	34½	"
38	Danish Island	" 19	105	48-50	"	8¼- 9	57	2	34½	Considerably.

*Cross-bred varieties produced at the Experimental Farms are marked with an asterisk.

OATS—TEST OF VARIETIES—*Concluded.*

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, includ'g Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs.	
39	Big Four	Aug. 16	102	45–47	Stiff	7½–8½	54	24	33	Badly.
40	Goldfinder	" 16	102	40–42	"	8½–9½	54	4	33	"
41	Olive White*	" 17	103	45–47	"	9½–10½	53	18	34	"
42	Black Beauty	" 17	103	44–46	Medium	8 – 9	53	18	32	"
43	Improved American	" 17	103	42–44	Stiff	8½–9½	53	18	34	"
44	Colossal	" 13	99	48–50	Medium	9½–11	50	20	33	"
45	Olive Black*	" 20	106	40–42	Weak	8½–9½	47	2	33	"
46	Forbes*	" 20	106	44–46	Medium	9½–10½	47	2	34½	"
47	Early Angus	" 19	105	47–49	Stiff	8½–9½	46	16	32	"
48	Pense White*	" 16	102	41–43	"	8½–9½	46	16	35½	"
49	Daubeney	" 15	101	44–46	Weak	8 – 9	45	10	32	"
50	Tartar King	" 12	98	38–40	Stiff	8½–9½	45	10	31½	"
51	Sorgenfrei	" 12	98	42–44	Medium	7 – 8½	44	4	37	"
52	Welcome	" 11	97	44–46	"	6½–7½	43	18	35¼	"
53	Improved Ligowo	" 16	102	40–42	"	6¾–7½	42	12	34	"
54	Joanette (black)	" 20	106	36–38	"	7½–8½	41	6	32½	"
55	Probstey	" 17	103	44–46	Stiff	8 – 9	40	..	33	"
56	Chinese Naked	" 11	97	38–40	"	5½–6½	32	12	50½	"
57	Golden Tartarian	" 20	106	47–49	Medium	10½–11½	31	26	29½	"
58	Siberian	" 19	105	45–47	Stiff	8½–9½	31	6	33	"
59	Waverley	" 18	104	45–47	"	8 – 9	25	10	32	"
60	Storm King	" 19	105	40–42	"	10 – 11	20	20	31	"

Most Productive Varieties of Oats.—The most productive varieties of oats at this Farm during the past five years have been White Giant, Mennonite (yellow), Hazlett's Seizure, Holstein Prolific (white and yellow, mixed), Lincoln, Banner and Uberfluss (white and yellow mixed). Columbus (yellow), Golden Beauty (yellow) Golden Giant (yellow), American Triumph, Sensation, Wide Awake and Abundance have also done very well. The most productive black oat during the past five years has been Black Beauty.

Earliest Varieties of Oats.—Taking the average of the returns for the past five years, Tartar King is the earliest variety of oats which has been grown on this Farm for the full period. The following varieties, which have not been grown for the full five years, are also of interest on account of their earliness : Welcome, Daubeney and Gold Rain (yellow).

SIX-ROW BARLEY.

The following varieties were added to the uniform plots this year :—

Escourgeon ('Escourgeon de Printemps,' 'Carrée de Printemps').—This variety was obtained from France.

Black Japan.—Obtained in commerce in Ontario. This barley is distinguished by the fact that its hull is very dark in colour. The kernel itself is rather dark, but not so dark as the hull.

Eclipse.—This is a so-called 'six-row Chevalier' barley originated by Garton Bros., England. It does not resemble the Chevalier type.

Bere.—This is a variety of barley well-known in Great Britain, where it is sometimes referred to as 'four-row' barley. It, however, belongs to the six-row class. The seed for the plot arrived very late and could not be sown with the other varieties. The

date of ripening and the number of days required for maturing are, therefore, not recorded this season.

The plots were all one-fortieth of an acre. The seed was sown on May 5 at the rate of 1¾ bushels to the acre. Both the yield and the quality of the grain were satisfactory.

The yield per acre is expressed in 'bushels' of 48 pounds.

SIX-ROW BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs.	
1	Stella*	Aug. 1	88	42-44	Stiff	3¼-4	58	16	51	Slightly.
2	Nugent*	July 31	87	43-45	"	4 -4½	50	..	50½	"
3	Baxter	Aug. 2	89	39-41	"	3¼-3¾	46	32	51	"
4	Yale*	" 1	88	42-44	"	2½-3¼	45	20	48	"
5	Escourgeon	" 1	88	40-42	"	2 -2½	45	..	54	Considerably.
6	Sisolsk	" 2	89	40-42	"	3½-4¼	44	8	48¼	Slightly.
7	Common	July 28	84	36-38	"	3¼-4	43	36	51	"
8	Odessa	" 31	87	36-38	"	4 -4½	43	16	49½	"
9	Argyle*	Aug. 4	91	36-38	"	3 -3½	43	16	49½	"
10	Summit*	" 1	88	38-40	"	3¾-4¼	43	16	49½	"
11	Claude*	" 3	90	37-39	"	3½-4¼	43	16	50	"
12	Mensury	July 28	84	36-38	"	3¼-4	42	24	49½	"
13	Black Japan	Aug. 3	90	28-30	"	2 -2½	41	32	49½	Considerably.
14	Blue Long Head	" 6	93	34-36	Medium	3 -3½	41	12	42	"
15	Empire*	" 3	90	36-38	Stiff	3½-4	41	12	48	"
16	Garfield*	" 3	90	39-41	"	3¼-4	40	40	49½	Slightly.
17	Rennie's Improved	July 28	84	34-36	"	3 -3¾	40	..	51½	"
18	Bere	....	....	28 30	Weak	3 -3½	39	8	45	Badly.
19	Brome*	Aug. 3	90	37-39	Stiff	2¾-3¼	37	24	51	Slightly.
20	Hulless Black	" 4	91	34-36	Weak	3 -3½	37	4	61½	Considerably.
21	Oderbruch	" 3	90	38-40	Stiff	3 -3¾	36	32	50½	Slightly.
22	Albert*	" 2	89	36-38	"	4 -4¾	36	12	49	"
23	Royal*	" 1	88	30-32	"	3¼-3¾	34	8	50	"
24	Norwegian	" 4	91	34-36	Medium	3½-4	34	8	47	"
25	Eclipse	" 4	91	35-37	Stiff	3 -3¾	32	4	52	"
26	Trooper*	July 29	85	28-30	Medium	3 -3½	27	4	49½	"
27	Silver King	Aug. 2	89	30-32	Stiff	3½-4¼	26	12	48½	"
28	Champion (beardless)	" 3	90	35-37	"	3 -3¾	22	24	42	"
29	Mansfield*	" 13	100	32-34	Medium	3 -3½	17	44	45	Badly.
30	Chinese Hulless	" 7	94	30-32	"	2¾-3¼	14	28	59½	"

*Cross-bred varieties produced at the Experimental Farms are marked with a asterisk.

Most Productive Varieties of Six-row Barley.—Taking the average of the retur for the last five years, the varieties of six-row barley found to be the most productiv at this Farm are Stella, Blue Long Head, Odessa and Mensury.

Earliest Varieties of Six-row Barley.—The differences in earliness to be obser among the varieties of six-row barley are not very striking. Among the earliest sorts are Mensury, Common, Odessa and Stella.

Beardless Six-row Barley.—The tests carried on at this Farm indicate that Champion is the best variety of beardless barley that has been grown here. It gives, however, rather a small yield. It ripens early.

Hulless Six-row Barley.—The most productive variety of hulless barley which has been tested at this Farm is Hulless Black. This is a bearded sort.

TWO-ROW BARLEY.

Several additional varieties of two-row barley were included in the plots this season.

Swedish Chevalier, Princess, Primus and Hannchen are selected strains of seed from Sweden, kindly supplied to us through the courtesy of the United States Department of Agriculture.

Swan's Neck is another variety received from Sweden.

The seed of all these new sorts was very plump and heavy.

The plots of two-row barley were sown on May 4, the seed being used at the rate of two bushels to the acre. The plots were one-fortieth of an acre.

The yield per acre is expressed in 'bushels' of 48 pounds.

TWO-ROW BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, includi'g Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per measured bush'l after cleaning.	Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs.	
1	Swedish Chevalier....	Aug. 4	92	25—27	Medium..	3½—4¼	47	24	52½	Slightly.
2	Swan's Neck..................	" 4	92	32—34	Stiff	3¼—3¾	46	12	51½	"
3	Canadian Thorpe....... .	" 4	92	28—30	"	3 —3½	44	8	52	"
4	French Chevalier.......	" 5	93	31—33	"	3¼—4	44	8	51½	Considerably.
5	Princess Sialof.............	" 9	97	28—30	Medium..	3¾—4¼	43	36	51	Slightly.
6	Bestehorn's Kaiser	" 7	95	26—28	" ..	3 —3½	43	16	50½	Considerably.
7	Primus...........	" 4	92	31—33	Stiff	3 —3½	42	24	52	Slightly.
8	Princess.....................	" 6	94	28—30	Medium..	3¾—4¼	42	4	51	Considerably.
9	Standwell....................	" 7	95	28—30	" ..	3¼—4	41	32	51	"
10	Gordon*.............	" 3	91	30—32	Stiff	2¾—3¼	39	28	51¼	"
11	Invincible......	" 8	96	27—29	Medium..	3 —3¾	36	32	50½	"
12	Jarvis*	" 1	89	40—42	Stiff	4 —4¾	35	40	51½	Slightly.
13	Brewer's Favourite........	" 8	96	27—29	Medium..	3¼—3¾	35	40	51½	Considerably.
14	Newton.......................	" 8	96	26—28	Stiff	3 —3½	33	36	50	"
15	Danish Chevalier............	" 4	92	33—35	"	4 —4½	32	44	51	Slightly.
16	Fulton*........................	" 3	91	34—36	"	3¼—3¾	32	44	52½	Considerably.
17	Clifford*	" 3	91	34—36	"	3¼—4	32	24	52	Slightly.
18	Hannchen	" 2	90	26—28	"	3½—4	32	24	53½	"
19	Fichtel Mountain.	" 7	95	30—32	Medium..	4 —4½	32	4	52	Considerably.
20	Beaver*...	" 1	89	39—41	Stiff	4 —4½	31	32	50½	"
21	Sidney*................ ...	" 3	91	31—33	"	3½—4	30	20	52	Slightly.
22	Harvey*..................	" 6	94	33—35	"	3¼—3¾	29	28	51½	Considerably.
23	Pelham*.......	" 3	91	33—35	"	3½—4¼	28	36	49½	Slightly.
24	Plumage.............. ...	" 8	96	32—34	"	3¼—3¾	28	36	49	Considerably.
25	Maltster.....................	" 13	101	25—27	Medium..	2½—3	21	12	52½	"
26	Logan*.......................	" 10	98	31—33	" ..	3½—4¼	20	..	49½	Badly.
27	Dunham*...............	" 12	100	32—34	" ..	3½—4	15	..	46½	"

*Cross-bred varieties produced at the Experimental Farms are marked with an asterisk.

Most Productive Varieties of Two-row Barley.—Taking the average of the returns for the past five years, the varieties of two-row barley found to be the most productive at this Farm are: French Chevalier, Canadian Thorpe, Beaver and Danish Chevalier.

Earliest Varieties of Two-row Barley.—The earliest among the more productive varieties of two-row barley grown at this Farm are: Beaver, Jarvis and Gordon. These ripen, as a rule, about two days before French Chevalier and Canadian Thorpe.

WINTER SIX-ROW BARLEY.

A variety of six-row winter barley known as Zero, was added to the plots of autumn-sown grain in 1903. This barley was introduced by Garton Bros., England, who claim extreme hardiness for it. A plot of one-eightieth of an acre was sown on the 10th of September, 1903, though the amount of seed on hand was only sufficient for a rather thin sowing. The plot was partly winter killed, but gave a yield at the rate of 41 bushels 32 lbs. per acre. The date of ripening was July 28.

Further tests of the hardiness and productiveness of this barley are being made.

PEASE.

The plots of pease were one-fortieth of an acre each. The seed was sown on the 4th of May at the rate of from two to three bushels per acre, according to the size of the pea. The crop produced this season was larger than the average.

A few of the less productive varieties of peas grown in previous years have been discontinued.

The yield per acre is expressed in 'bushels' of 60 pounds.

PEASE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw, includ'g Head.	Character of Straw.	Length of Pod.	Yield per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Bush.	Lbs.	Lbs.
1	Mackay*	Aug.	13	101	45-50	Strong ...	2¼-2¾	45	40	62
2	Victoria*	"	19	107	55-60	"	2½-3	45	..	62¾
3	Golden Vine	"	12	100	50-55	"	2 -2½	42	20	63½
4	Prince*	"	14	102	55-60	"	2 -2½	42	..	62½
5	Prince Albert	"	13	101	60-65	"	2¼-2¾	41	20	62
6	Archer*	"	15	103	45-60	Medium..	2¼-2¾	41	20	63½
7	Picton*	"	12	100	40-45	" ..	2¼-2¾	41	..	64
8	King*	"	13	101	50-55	Strong...	2 -2½	39	40	63¼
9	Cooper*	"	14	102	45-50	Medium..	2¼-2¾	39	..	64
10	Nelson*	"	11	99	30-35	" ..	2 -2½	38	40	64
11	Prussian Blue	"	14	102	55-60	Strong...	2 -2¼	38	20	64
12	White Wonder	"	9	97	30-35	Medium..	2 -2¾	37	40	63½
13	Agnes*	"	12	100	45-50	Strong...	2¼-2¾	37	20	64
14	Kent*	"	15	103	43-48	"	2¼-2½	36	40	62½
15	Field Gray	"	10	98	25-30	Weak	1¾-2¼	36	40	63
16	Wisconsin Blue	"	15	103	45-50	Medium..	2 -2½	35	20	64¼
17	German White	"	10	98	45-50	" ..	2 -2½	34	40	63
18	Daniel O'Rourke	"	10	98	35-40	" ..	2 -2½	34	..	62¼
19	Gregory*	"	19	107	40-45	Strong...	2¼-2¾	34	..	63¼
20	White Marrowfat	"	13	101	40-45	"	2½-3	33	20	62
21	Canadian Beauty	"	13	101	55-60	"	2½-3	32	..	63
22	Macoun*	"	19	107	60-65	"	2 -2½	32	..	63
23	Black-eyed Marrowfat	"	13	101	45-50	"	2½-3	31	..	62
24	Chancellor	"	9	97	45-50	Medium..	2 -2¾	30	..	63½
25	Arthur*	"	11	99	50-55	" ..	2½-2¾	29	40	63½
26	Mummy	"	19	107	43-48	" ..	2¼-2¾	29	40	63
27	English Gray	"	13	101	45-50	" ..	2 -2½	29	20	62
28	Early Britain	"	14	102	40-45	" ..	2¼-2¾	27	20	61
29	Pride	"	9	97	35-40	" ..	2 -2½	26	..	62
30	Crown	"	10	98	40-45	Strong...	2 -2½	26	..	64
31	Duke*	"	12	100	40-45	"	2¼-2¾	25	..	63½
32	Pearl*	"	11	99	45-50	"	2½-3	23	..	62¼
33	Carleton*	"	13	101	45-50	"	1¾-2¼	22	..	64
34	Paragon*	"	8	96	20-25	Weak	2¼-2¾	21	20	63

*Cross-bred varieties produced at the Experimental Farms are marked with an asterisk.

Most Productive Varieties of Peas.—Taking the average of the returns for the last five years, the varieties of peas found to be the most productive at this Farm are:—Golden Vine, Prussian Blue, Paragon, Cooper, Prince and Kent.

Earliest Varieties of Peas.—Chancellor appears to be the earliest ripening variety. It ripens, as a rule, about 4 or 5 days before Golden Vine and gives a good yield.

SPRING RYE.

One plot of spring rye (one-fortieth acre) was sown on May 3, the seed being used at the rate of one and one-half bushels to the acre. The rye made strong growth and was ripe August 7 (96 days). The straw was stiff, its length (including the head) being 64 to 66 inches. The length of the heads was from $3\frac{3}{4}$ to $4\frac{1}{2}$ inches. The rye was slightly attacked by rust. The yield, expressed in 'bushels' of 56 lbs., was 34 bushels 36 lbs. per acre; and the weight of the grain (after cleaning) was $58\frac{1}{2}$ lbs. to the measured bushel.

WINTER RYE.

Four varieties of winter rye were sown on September 10, 1903. The plots were one-eightieth of an acre. The seed was used at the rate of $1\frac{1}{2}$ bushels per acre.

Giant and Emerald were obtained from France, Mammoth White was procured in New York State and Thousandfold in Ontario.

The yield per acre is expressed in 'bushels' of 56 lbs.

WINTER RYE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Rusted.
				In.		In.	Bush.	lbs.	Lbs.	
1	Giant	July 25	319	63-65	Weak	$4\frac{1}{2}$-$5\frac{1}{4}$	70	40	$56\frac{1}{4}$	No rust.
2	Emerald	" 25	319	63-65	Medium	$4\frac{1}{2}$-$5\frac{1}{4}$	62	48	55	"
3	Mammoth White	" 21	315	60-62	Stiff	$4\frac{1}{4}$-5	57	48	$59\frac{1}{2}$	"
4	Thousandfold	" 23	317	66-68	"	$3\frac{1}{4}$-4	40	..	60	"

GRAIN SOWN IN DIFFERENT QUANTITIES PER ACRE ON SANDY LOAM.

These experiments were all conducted on plots of one-fortieth of an acre each. The wheat was sown May 3 and was ripe August 9. The oats were sown May 3 and were ripe August 9. The barley was sown May 3 and was ripe August 2.

The results of the tests in previous years are published, for comparison, along with the figures obtained this year.

Name of Variety.	Quantity Sown per Acre.	Number of Days from Sowing to Harvesting.				Yield per Acre.							
		1901.	1902.	1903.	1904.	1901.		1902.		1903.		1904.	
						Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.
Preston Wheat.......	1 bushel..	100	108	108	98	10	20	24	..	15	..	22	20
" "	1¼ bushels	100	108	108	98	15	..	20	40	14	20	24	20
" "	1½ "	100	108	108	98	19	40	15	20	20	40	20	40
" "	2 "	100	108	108	98	20	20	10	40	15	20	17	20
" "	2½ "	100	108	108	98	21	..	20	40	13	20	17	20
" "	3 "	100	108	108	98	19	40	17	20	16	40	26	40
Banner Oats........	1½ "	96	107	108	98	41	6	60	..	63	18	43	18
" "	2 "	96	107	108	98	59	14	45	30	56	16	78	8
" "	2½ "	96	107	108	98	57	2	52	32	79	14	75	10
" "	3 "	96	107	108	98	43	18	50	20	84	4	77	22
" "	3½ "	96	107	108	98	31	26	50	20	88	8	92	12
" "	4 "	96	107	108	98	35	10	54	4	67	22	84	4
Mensury Barley......	1½ "	84	95	105	91	35	35	40	40	61	32	35	40
" "	2 "	84	95	105	91	37	19	28	16	60	..	49	8
" "	2½ "	84	95	105	91	43	11	27	24	54	28	40	40
" "	3 "	84	95	105	91	42	19	37	24	46	12	32	24
" "	3½ "	84	95	105	91	39	23	26	32	47	44	41	32
" "	4 "	84	95	105	91	43	11	45	..	35	40	52	44

GRAIN SOWN IN DIFFERENT QUANTITIES PER ACRE ON CLAY LOAM.

These experiments were all conducted on plots of one-fortieth of an acre each. The wheat was sown May 5 and was ripe August 8. The oats were sown May 5 and were ripe August 8. The barley was sown May 5 and was ripe July 28.

The results of the tests in previous years are published, for comparison, along with the figures obtained this year.

Name of Variety.	Quantity Sown per Acre.	Number of Days from Sowing to Harvesting.				Yield per Acre.							
		1901.	1902.	1903.	1904.	1901.		1902.		1903.		1904.	
						Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.
Preston Wheat.......	1 bushel..	97	108	108	95	28	20	24	40	28	40	16	40
" "	1¼ bushels	97	108	108	95	28	20	24	40	30	..	23	40
" "	1½ "	97	108	108	95	29	..	29	20	30	40	25	40
" "	2 "	97	108	108	95	26	20	28	..	28	..	22	20
" "	2½ "	97	108	108	95	26	20	30	..	29	40	21	20
" "	3 "	97	108	108	95	25	..	24	40	28	20	19	20
Banner Oats.........	1½ "	92	111	110	95	58	28	63	18	72	32	64	24
" "	2 "	92	111	110	95	65	30	62	12	78	28	63	38
" "	2½ "	92	111	110	95	67	2	72	32	74	4	71	6
" "	3 "	92	111	110	95	64	24	67	2	80	20	65	10
" "	3½ "	92	111	110	95	61	6	70	20	84	24	75	10
" "	4 "	92	111	110	95	57	22	67	2	88	28	66	16
Mensury Barley......	1½ "	83	99	103	84	37	..	64	8	54	28	48	36
" "	2 "	83	99	103	84	40	35	70	40	59	28	46	12
" "	2½ "	83	99	103	84	44	3	68	16	48	16	52	24
" "	3 "	83	99	103	84	45	35	69	8	50	..	56	12
" "	3½ "	83	99	103	84	45	35	65	..	50	..	51	32
" "	4 "	83	99	103	84	44	3	62	24	58	16	54	8

PLOTS OF MIXED GRAIN.

It has been thought well to undertake some experiments in growing mixed grains, especially with a view to determining which varieties should be selected when two or more kinds are being sown together.

In choosing the varieties for these plots the greatest care is exercised to sow together only such sorts as are known to mature in almost the same number of days, so that they may both be ready for cutting at the same time. Only one column is given for the number of days maturing, as in every case the mixtures ripened with great uniformity.

The plots were one-fortieth of an acre, and the seed was sown on May 7, at the rate of one bushel per acre of each variety. In some instances this did not seem to be a large enough quantity of seed. It is therefore proposed to increase the amount next season.

—	Date of Ripening.	No. of Days Maturing.	Yield per Acre.	Proportions in Crop Harvested.
			Lbs.	
Wheat and Oats—				
Preston wheat and White Giant oats.	Aug. 13..	98	2,140	24 per cent wheat and 76 per cent oats.
Wheat and Two-row Barley—				
Gehun wheat and French Chevalier barley..................	" 5..	90	1,880	42 " " 58 " barley.
Wheat and Pease—				
Huron wheat and Arthur pease.. ...	" 10..	95	1,700	52 " " 48 " pease.
Oats and Emmer—				
Banner oats and Common emmer	" 13..	98	2,560	72 " oats 28 " emmer
Oats and Two-row Barley—				
Welcome oats and French Chevalier barley..........................	" 8..	93	2,180	57 " " 43 " barley.
Wallace oats and Princess Sialof barley..............................	" 10..	95	1,820	60 " " 40 " "
Oats and Pease—				
White Giant oats and Chancellor pease	" 11..	97	2,520	80 " " 20 " pease.
Two-row Barley and Pease—				
Maltster barley and Paragon pease...	" 14..	99	2,320	59 " barley 41 " "

SOJA BEANS.

In addition to the Common Soja Bean, experiments were tried this season with a selected strain of Early Yellow Soja Bean kindly supplied by Prof. C. A. Zavitz, of the Ontario Agricultural College. All the plots were sown on May 28 and cut on October 17. The size of the plots was one-fortieth of an acre. None of the beans ripened properly.

Early Yellow Soja Bean.—The beans were sown with a hand seed drill in rows 28 inches apart, and made strong growth, reaching a height of 30 to 35 inches. Total yield of green crop, 4 tons 600 lbs. per acre.

Common Soja Bean.—Two plots of this variety were sown, the beans being put in with different distances between the rows.

Plot 1.—Sown in rows 21 inches apart; growth strong and even, leafy; average height 35 to 38 inches; total yield of green crop, 4 tons 1,200 lbs. per acre.

Plot 2.—Sown in rows 28 inches apart; growth strong and leafy; average height, 35 to 38 inches; stalks considerably stiffer than in Plot 1; total yield of green crop, 4 tons 1,400 lbs. per acre.

HORSE BEANS.

Two plots of one-fortieth acre each were sown on May 28, with the rows at different distances apart. The plots were cut green on October 17. The beans did not ripen.

Plot 1.—Sown in rows 21 inches apart; growth strong, but rather thin; pods fairly numerous; height, 40 to 45 inches; crop all stood up well; total yield of green crop, 3 tons 1,600 lbs. per acre.

Plot 2.—Sown in rows 28 inches apart; growth very strong; pods fairly numerous; height, 40 to 45 inches; crop all stood up well; total yield of green crop, 5 tons 400 lbs. per acre.

FIELD BEANS.

Four plots of field beans were sown this season, in continuation of some experiments which have been carried on at this Farm for several years past, but which have not previously been mentioned in the Annual Report.

The plots were one-fortieth of an acre, and the beans were sown on May 28.

The yield per acre is expressed in 'bushels' of 60 lbs.

FIELD BEANS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Length of Pod.	Yield per Acre.	
				Inches.	Inches.	Bush.	Lbs.
1	White Field	Sept. 22..	117	23-27	4 -4½	46	40
2	Marrowfat	" 22..	117	25-30	3½-4	42	40
3	California Pea Bean	" 3..	98	15-17	3½-4¼	33	20
4	Norwegian Brown	Aug. 27..	91	14-16	5 -5¾	26	40

FLAX.

Uniform test plots of flax, one-fortieth of an acre each, were commenced this season for the purpose of ascertaining the relative productiveness and earliness of the different varieties. The seed of most of the kinds was obtained from France.

The seed was sown on May 28 at the rate of 60 pounds to the acre.

The yield per acre is expressed in 'bushels' of 56 lbs.

FLAX—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Plants.	Weight of Seed per measured bushel.	Yield per Acre.	
				Inches.	Lbs.	Bush.	Lbs.
1	Yellow Seed	Aug. 21..	85	31-33	52½	20	..
2	Novarossick	" 23..	87	28-30	53½	19	10
3	White Flowering	" 15..	79	27-29	55½	16	40
4	Riga	" 22..	86	35-37	55½	15	10
5	Russian	" 11..	75	34-36	54½	12	20
6	Common	" 12..	76	31-33	55	12	..
7	La Plata	Sept. 6..	101	26-28	52	11	10

TURNIPS.

Two sowings were made of each variety, the first on May 17 and the second on May 31. The seed was used at the rate of about four pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller, which flattened the drills nearly one-half, leaving a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about seven inches apart in the rows.

The roots were pulled on two different dates: October 14 and October 28. The yield per acre has been calculated from the weight of roots gathered from two rows, each 66 feet long.

A good yield was obtained.

In Canada the ton contains 2,000 lbs.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing, 1st Pulling.		Yield per Acre from 2nd Sowing, 1st Pulling.		Yield per Acre from 1st Sowing, 2nd Pulling.		Yield per Acre from 2nd Sowing, 2nd Pulling.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Magnum Bonum	42	150	17	1,310	47	545	25	1,480
2	Kangaroo	40	850	17	980	45	255	27	945
3	Hall's Westbury	40	272	20	1,827	46	1,060	31	535
4	Sutton's Champion	39	1,860	24	15	41	1,490	26	965
5	Imperial Swede	39	45	19	32	44	1,595	26	965
6	Halewood's Bronze Top	37	1,817	19	1,765	41	1,985	26	1,625
7	Hartley's Bronze	37	1,652	20	1,910	45	1,245	31	1,030
8	Mammoth Clyde	36	1,672	16	1,990	39	705	25	1,645
9	Jumbo	36	1,342	18	1,207	41	335	23	1,025
10	Emperor Swede	36	930	18	1,290	38	890	22	1,870
11	Good Luck	36	435	19	1,022	37	1,900	25	1,315
12	Perfection Swede	35	785	17	1,887	45	915	26	1,625
13	Drummond Purple Top	35	372	18	1,125	41	500	28	1,090
14	Carter's Elephant	34	227	20	260	44	1,265	25	1,150
15	Elephant's Master	33	1,155	18	135	37	250	24	1,665
16	Skirvings	32	1,010	18	630	41	1,325	26	470
17	Selected Purple Top	31	1,607	18	217	41	170	25	655
18	East Lothian	31	205	15	360	37	1,570	23	530
19	New Century	30	885	17	1,970	47	545	28	925
20	Bangholm Selected	24	1,830	18	1,207	32	350	26	1,955

	Tons.	Lbs.
The average yield from the 1st sowing, 1st pulling, was	35	1,255
The average yield from the 1st sowing, 2nd pulling, was	41	1,845
The average yield from the 2nd sowing, 1st pulling, was	18	1,657
The average yield from the 2nd sowing, 2nd pulling, was	26	973

MANGELS.

Two sowings were made of each variety, the first on May 17, and the second on May 31. The seed was used at the rate of about six pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about seven inches apart in the rows. The roots were pulled on two different dates: October 14 and October 28. The yield has been calculated in each case from the weight of roots gathered from two rows, each 66 feet long.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing, 1st Pulling.		Yield per Acre from 2nd Sowing, 1st Pulling.		Yield per Acre from 1st Sowing, 2nd Pulling.		Yield per Acre from 2nd Sowing, 2nd Pulling.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Prize Mammoth Long Red	37	167	17	815	29	245	29	1,235
2	Half Long Sugar White	36	1,507	18	1,785	39	1,035	20	1,745
3	Mammoth Long Red	34	1,630	17	897	38	395	19	940
4	Mammoth Yellow Intermediate	34	722	17	1,640	33	1,815	18	135
5	Yellow Intermediate	32	1,257	16	1,907	32	1,010	16	175
6	Giant Yellow Intermediate	32	1,175	16	1,495	32	680	20	260
7	Triumph Yellow Globe	31	40	16	422	27	1,770	18	1,290
8	Lion Yellow Intermediate	30	637	17	1,310	29	1,070	18	795
9	Prize Winner Yellow Globe	30	142	15	1,762	22	880	16	670
10	Leviathan Long Red	29	1,482	14	1,452	34	1,465	20	1,085
11	Selected Mammoth Long Red	29	80	16	340	24	1,995	15	195
12	Giant Sugar Mangel	28	1,090	15	1,185	23	695	16	1,660
13	Giant Yellow Globe	27	285	13	1,390	20	920	13	1,885
14	Half Long Sugar Rosy	26	1,542	14	957	30	1,050	17	1,805
15	Selected Yellow Globe	24	1,665	14	1,287	24	1,665	14	1,370
16	Gate Post	24	1,005	16	670	26	470	17	815

	Tons.	Lbs.
The average yield from the 1st sowing, 1st pulling, was	30	1,277
The average yield from the 1st sowing, 2nd pulling, was	29	823
The average yield from the 2nd sowing, 1st pulling, was	16	582
The average yield from the 2nd sowing, 2nd pulling, was	18	754

CARROTS.

Two sowings were made of each variety, the first on May 17, and the second on May 31. The seed was used at the rate of about four pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about five inches apart in the rows. The roots were pulled on two different dates : October 14 and October 28. The yield has been calculated in each case from the weight of roots gathered from two rows, each 66 feet long.

CARROTS—TEST OF VARIETIES

Number.	Name of Variety.	Yield per Acre from 1st Sowing, 1st Pulling.		Yield per Acre from 2nd Sowing, 1st Pulling.		Yield per Acre from 1st Sowing, 2nd Pulling.		Yield per Acre from 2nd Sowing, 2nd Pulling.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Giant White Vosges	24	1,995	21	570	30	1,545	22	1,045
2	Ontario Champion	24	840	16	1,165	26	965	24	180
3	New White Intermediate	24	592	18	1,785	24	1,335	20	755
4	Mammoth White Intermediate	23	200	19	1,600	27	1,110	18	1,785
5	Improved Short White	21	1,560	20	1,415	27	1,110	22	1,045
6	Long Yellow Stump Rooted	19	1,930	16	1,330	25	325	19	610
7	Carter's Orange Giant	19	1,022	17	1,805	22	1,870	21	1,395
8	Half Long Chantenay	18	1,950	13	1,225	17	1,310	13	70
9	Early Gem	18	300	17	1,305	16	1,495	18	1,290
10	White Belgian	17	815	14	710	18	630	13	895

	Tons.	Lbs.
The average yield from the 1st sowing, 1st pulling, was	21	520
The average yield from the 1st sowing, 2nd pulling, was	23	1,570
The average yield from the 2nd sowing, 1st pulling, was	17	1,541
The average yield from the 2nd sowing, 2nd pulling, was	19	907

SUGAR BEETS.

Two sowings were made of each variety, the first on May 17, and the second on May 31. The seed was used at the rate of about six pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about five inches apart in the rows. The roots were pulled on two different dates : October 14 and October 28. The yield has been calculated in each case from the weight of roots gathered from two rows, each 66 feet long. Though all the varieties mentioned here are commonly classed as sugar beets, it should be noted that the only ones recommended for use in the manufacture of sugar are Wanzleben, French Very Rich, and Vilmorin's Improved.

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing, 1st Pulling.		Yield per Acre from 2nd Sowing, 1st Pulling.		Yield per Acre from 1st Sowing, 2nd Pulling.		Yield per Acre from 2nd Sowing, 2nd Pulling.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Red Top Sugar	32	762	18	465	31	700	18	465
2	Royal Giant	31	40	18	135	31	535	18	795
3	Danish Improved	27	532	15	1,680	27	945	17	980
4	Danish Red Top	26	222	14	380	26	1,955	17	1,640
5	Improved Imperial	23	1,272	15	277	29	410	18	1,620
6	Wanzleben	21	982	15	1,432	18	1,785	16	505
7	Vilmorin's Improved	19	1,847	12	585	18	465	11	935
8	French Very Rich	17	1,062	11	110	24	345	16	1,990

	Tons.	Lbs.
The average yield from the 1st sowing, 1st pulling, was..	24	1,840
The average yield from the 1st sowing, 2nd pulling, was..	25	1,892
The average yield from the 2nd sowing, 1st pulling, was..	15	133
The average yield from the 2nd sowing, 2nd pulling, was..	16	1,866

INDIAN CORN.

The corn was sown with the seed drill in rows thirty-five inches apart, and was also sown in hills thirty-five inches apart each way. When the plants were about six inches high they were thinned out, leaving them from six to eight inches apart in the rows, and leaving four or five plants in each hill. The seed was sown June 7, and the corn was cut green for ensilage September 16. The yield has been calculated from the weight of crop cut from two rows, each 66 feet long.

For the making of ensilage the corn should be cut when the kernels are in the late milk or doughy stage; but the summer at Ottawa is not always warm enough to bring the later varieties to this state of maturity before it is necessary to cut the crop to avoid frost.

Thoroughbred White Flint was omitted this season, as it was not found possible to obtain seed of this variety in good condition.

In Canada the ton contains 2,000 pounds.

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Growth.	Height.	Leafiness.	Condition when Cut.	Weight per Acre grown in Rows.		Weight per Acre grown in Hills.	
			Inches.			Tons.	Lbs.	Tons.	Lbs.
1	Eureka	Strong	100-105	Very leafy	Early milk	26	140	21	570
2	Superior Fodder	Very strong.	110-115	"	"	25	600	28	100
3	Giant Prolific Ensilage	"	105-110	"	"	24	1,500	22	1,320
4	Salzer's All Gold	"	100-105	Medium	"	23	420	26	1,680
5	Red Cob Ensilage	"	105-110	"	"	21	1,780	23	970
6	White Cap Yellow Dent	Medium	85- 90	Very leafy	"	21	1,780	23	530
7	Early Butler	Strong	90- 95	Leafy	"	19	910	17	1,750
8	Mammoth Cuban	Very strong.	100-105	Very leafy	Late milk	18	1,730	19	1,380
9	Pride of the North	"	105-110	Medium	Early milk	18	850	20	370
10	Early Mastodon	Strong	100-105	Leafy	"	18	520	14	820
11	North Dakota White	Medium	65- 70	"	"	17	1,530	18	520
12	Cloud's Early Yellow	Strong	95-100	"	"	17	980	17	870
13	King Philip	Medium	70- 75	Medium	Late milk	17	320	19	830
14	Champion White Pearl	Strong	95-100	Leafy	Early milk	16	1,330	15	140
15	Compton's Early	Medium	75- 80	Medium	"	16	835	19	1,820
16	Longfellow	"	65- 70	Leafy	Late milk	15	1,240	17	1,200
17	Evergreen Sugar	"	75- 80	Very leafy	"	15	1,240	16	120
18	Angel of Midnight	Strong	70- 75	Leafy	Early milk	14	1,590	17	1,200
19	Selected Leaming	"	100-105	"	"	12	750	13	290

The average yield from the rows was 19 tons 109 pounds per acre, and from the hills, 19 tons 1,183 pounds per acre; showing an advantage, this season, of 1,074 pounds per acre in favour of the corn grown in rows.

INDIAN CORN SOWN AT DIFFERENT DISTANCES.

Three varieties were chosen for this test: Champion White Pearl, Selected Leaming, and Longfellow. The seed was sown June 7 and the corn was cut for ensilage September 16. Sixteen rows of each variety were sown, that is, four rows at each of the distances mentioned, and the yield per acre has been calculated from the weight of crop obtained from the two inner rows in each case. The length of the portions of the rows cut for weighing was 66 feet.

Name of Variety.	Distance between the Rows.	Character of Growth.	Height when Cut.	Condition when Cut.	Yield per Acre.	
	In.		In.		Tons.	Lbs.
Champion White Pearl	21	Very strong.	90—95	Early milk	22	1,927
" "	28	"	105—110	"	18	660
" "	35	"	105—110	"	19	1,050
" "	42	"	105—110	"	21	488
Selected Leaming	21	"	95—100	"	22	1,360
"	28	"	100—105	"	17	686
"	35	"	100—105	"	20	1,030
"	42	"	100—105	"	20	1,548
Longfellow	21	Medium	70—75	Late milk	17	209
"	28	"	80—85	"	16	7
"	35	"	80—85	"	14	1,810
"	42	"	80—85	"	16	1,652

It will be seen that, in every case, the largest yield was obtained from the rows which were closest together; though the corn in these rows was not so tall as in the others.

FIELD PLOTS OF POTATOES.

As the experimental plots of field roots and fodder corn do not occupy the whole of the field in which they are placed, it is usual to fill the remaining space with potatoes, such varieties being grown as are likely to be of service in the annual distribution of samples from this Farm.

The area devoted to the different varieties varies considerably.

The potatoes were planted May 28 and dug October 8. A satisfactory crop was obtained. A certain amount of rot was noticed, the varieties chiefly affected being Carman No. 1, Uncle Sam, Bovee and Canadian Beauty.

The yield per acre is expressed in 'bushels' of 60 lbs.

Number.	Name of Variety.	Yield per Acre.	
		Bush.	Lbs.
1	Dr. Maercher	435	9
2	Burnaby Mammoth	421	25
3	Country Gentleman	408	..
4	Carman No. 1	372	8
5	Late Puritan	342	..
6	American Wonder	340	48
7	Uncle Sam	324	33
8	Swiss Snow-Flake	314	24
9	Money Maker	309	34
10	Reeve's Rose	309	24
11	Early White Prize	289	..
12	State of Maine	261	51
13	Bovee	246	5
14	Canadian Beauty	220	2
15	Dreer's Standard	210	35
16	Everett	202	8
17	Early Andes	194	20
18	Maule's Thoroughbred	191	24
19	Penn Manor	183	25
20	Vick's Extra Early	125	..

REPORT OF THE POULTRY MANAGER

(A. G. GILBERT.)

OTTAWA, December 1, 1904.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the pleasure of submitting to you herewith the seventeenth annual report of the Poultry Department of the Central Experimental Farm.

The work of the past year has been marked by important features and results, principally confirmatory of experimental research, began some years ago. New lines of investigation and experiment have been undertaken, in the prosecution of which it is hoped to secure much useful and instructive data. Some of the subjects discussed in this report are :—

1. Advanced phases of poultry keeping.
2. Some features of the egg and poultry markets.
3. Reasons for the high price of strictly new laid eggs in summer.
4. Effects of early moulting on the summer egg supply.
5. Delay in the resumption of egg laying after the hens have moulted.
6. Early pullets required for fall layers.
7. Are fowls as good layers one season as another ?
8. Some reasons why pullets should be kept longer than one year.

The experimental work proper of the year is described in detail, and includes among other mattters :—

The treatment of the laying stock last fall so as to have them to go into winter quarters in proper condition.

Effects of various rations on groups of fowls of different ages.

Artificial and natural incubation and results.

Continued investigation into the cause or causes of so many weak germs in eggs laid in early spring by hens which were kept in warm houses and fed for egg production. Particulars are given in a number of tables.

Results of experiments to show how long after removal of the male bird from the breeding pen fertilization of the egg remains strong enough to hatch a strong chicken. The outside limit so far appears to be five days.

An important location of tuberculosis in fowls sent from British Columbia. The result of a *post mortem* examination by Dr. Higgins of the veterinary laboratory.

During the summer a poultry house, consisting of two divisions of 10 feet by 8, with scratching shed attachment 10 by 11 was erected. It is arranged and fitted according to the most approved and up-to-date designs. In the use of this house, which contains 25 pullets in each division, much valuable experience is anticipated.

On the morning of April 8 last, fire was discovered in the centre office of the main poultry building. It was fortunately extinguished before it had made serious headway, but not before 35 birds in adjoining pens had been suffocated; 75 early chickens were also burned to death, and one thousand eggs, set apart for incubator use were destroyed. This mishap caused delay in getting out early chickens and in the sending out of eggs for hatching purposes.

I have much pleasure in testifying to the ability and zeal displayed by my assistant manager, Mr. Fortier. His skill in the manipulation of the breeding stock and his care and success in the operation of the incubators and brooders were most marked. As a result of the latter, many details of value are embraced in this report.

Mr. George Deavey, I am happy to say, has shown interest and displayed energy in the discharge of his duties, with which, from long experience, he is now so well acquainted.

There were erected during this season, in addition to the poultry house mentioned, a temporary incubator room; colony houses of different sizes and design; brooders for incubators; trap nests, &c., &c. Two incubators of different patterns were also procured.

During the year addresses were delivered by the writer at Meaford, Winnipeg and at different points in Cape Breton, N.S.

Mr. Fortier delivered 43 addresses at meetings held throughout the province of Quebec during the months of January and February last. In March he attended a poultry show at St. Jerome, and another in August at Ayer's Flat. In August and September he attended poultry exhibits at Sherbrooke, Richmond and Ottawa. In the latter case the exhibit was made, during the month of September, at the annual fall show of the Central Canada Association, and consisted of an unusually attractive and instructive display, which elicited much appreciative comment.

Inquiry, both by letter and person during the year, in relation to all branches of poultry-keeping was greater than ever. It may be taken as a fair instance of the gratifying development that is rapidly taking place in the poultry branch of farm work, and which our experimental work is so well calculated to advance.

I have the honour to be, sir,
Your obedient servant,

A. G. GILBERT.

Before giving an account of the work of the past year it may be interesting and profitable to discuss certain features of poultry development which have made themselves evident during that period. It is gratifying to note that the poultry branch of farm work continues to make steady and satisfactory progress. Where fowls of the utility types are kept progress has been most rapid, and as a sequence of proper fowls and their good management results are satisfactory, because remunerative. Perhaps in no previous year has development in the more advanced phases of poultry-keeping been more apparent, more discussed and more inquired into than in the past twelve months. It may be asked what is meant by advanced phases of poultry-keeping ?

ADVANCED PHASES OF POULTRY-KEEPING.

By advanced phases of poultry-keeping are meant the thorough understanding of and putting into practice such methods of up-to-date management as experience has shown to be best calculated to enable producers to fill the requirements of the different markets of to-day to their greatest profit. A thorough and practical appreciation, then, of latest methods of management, as well as of the requirements of the market, is very necessary to success. Producers should realize that methods of poultry-keeping change from time to time, as do the requirements of the markets, and always in the way of advancement. It is to the advantage of producers to study the different features of the markets they are catering to. The city markets of to-day differ from those of even three and four years ago. There is an ever increasing call, from both

home and abroad, for better things and more of them. The most suitable product receives the highest value.

SOME FEATURES OF THE EGG AND POULTRY MARKET.

The markets of to-day may be described as follows :—

1.—A winter market with a growing demand for strictly new laid eggs for which high prices are paid more readily than heretofore. An article of guaranteed freshness, however, is required. A farmer's wife in the neighbourhood of the city writes on the 10th of November last (1904) 'that Mr. H. Gatehouse, poultry and game dealer, 806 Dorchester street, Montreal, has written offering me 40 cents per dozen for new laid eggs, but, they must not be more than 4 days old. His former limit was 10 days.' This shows a more exacting demand. It illustrates the trend of the market.

2.—A summer market imperatively calling for strictly new laid eggs with unimpaired flavour. They must also be of inviting appearance. The well-known firm of purveyors, Messrs. Bate & Son, Sparks street, Ottawa, paid as high, during midsummer last, as 25 cents per dozen to those from whom they could get eggs guaranteed strictly new laid. A member of the firm explained to the writer that these eggs were for customers 'who would take no other kind.' He added, 'and I will give now (August) 25 cents per dozen for such guaranteed strictly new laid eggs.'

3.—An Early Summer and Later Months Market for chickens of good size, correct type and in good condition, for which fairly remunerative prices are paid. The demand by the purchasing houses of Toronto heretofore has been for early 3½ to 4 months of age chickens for export. As to whether it will pay best to kill and dress those chickens for sale on a local or near city market, or to sell them alive, is a feature of the business requiring careful study. So far results go to show that, if the chicks are early and of requisite type and condition, it is best to sell them alive to one of the large purchasing firms for export. Mrs. Joseph Yuill writes 'that last spring she sold her first lot of early hatched chickens to the Canadian Produce Company of Toronto at 20 cents per lb. live weight.' But she must have had exceptional facilities for rearing the chickens at such an early season. It is to be remembered that these early chickens cannot be had except by artificial means, as pointed out in reports of previous years.

A STRIKING FEATURE.

The new and striking feature of the above situation is the enhanced price paid for guaranteed strictly new laid eggs in the summer months, and the effect it may have on the raising of chickens. It is in the summer months that chickens are hatched on the great majority of farms. The question occurs if the eggs are consumed where are the chickens to come from ?

The reasonable conclusion is that whatever branch of the business pays the producer best is the one he is most likely to prosecute. Apart from the inducement offered by the high prices of last summer, it does seem as if the production of eggs during the summer would commend itself to the farmer, at any rate, as it is likely to be attended with the lease trouble to him at a time of year when he is busiest. Looking at egg production by the farmer in winter the following is taken from departmental report of last year (1903) p. 245 : 'Observation has shown that there is a greater likelihood of a larger and more immediate supply of new laid eggs in winter from the farm, than of the superior quality of market poultry in later months. For the reason that so many farmers have more time in winter to care for their laying stock (and which attention is absolutely necessary) than they have in spring and early summer to devote to the hatching and rearing of chickens.' So it would seem that from both summer and winter standpoints the production of eggs is likely to be attended with the least difficulty to the farmer. We have also a skilled poultry authority, Mr. Boyer,

giving the following advice to an inquirer in a recent number of the American Poultry Journal to 'confine himself to the production of eggs as being the most profitable.' It is not likely, however, that a dearth of chickens will immediately follow, and it is quite possible that the high prices of summer and autumn eggs of the past two seasons may not be permanent. But it is a significant phase of the situation and one that the student of events is bound to take cognizance of.

WHY SUMMER EGGS HAVE BEEN SO HIGH.

It is an interesting phase and remarkable instance of the rapidity with which poultry keeping is taking place to find summer egg prices which have usually been 10 and 12 cents per dozen, attaining such values as 18, 20 and 25 cents for the same number. Eggs of the cheaper varieties were certainly to be had at the same time, but the increasing demand was for the better article. To the oft-repeated query, 'Why should new-laid eggs be so high at this season?' the reply was almost invariably given by the dealers, 'Because they are hard to get,' which was doubtless true, but it is not the only reason.

A more likely one is that consumers of the better class have found out, or, are being fast educated to the great difference there is between the clean looking, new-laid egg, with the delicious flavour it should always have, and the comparatively stale article. It is fast being realized that flavour and appearance can only come from carefully-fed and cleanly-kept fowls. Certainly in both appearance and flavour are the first quality eggs preferable to those laid by hens which have access to filthy substances, dirty water, &c., and deposit their eggs in unclean and ill-smelling nests.

Another reason may be that the more exacting demand for such carefully-selected eggs has resulted in city dealers buying from only reliable persons, who can be depended upon to send only what is wanted. These producers must be near the city market, or railway shipping point. A new laid egg stales quickly and shipments must necessarily be made frequently and in small quantities, in order to permit of the choice article being placed, as fast as possible, in the hands of the consumer. And the wideawake city purveyor finds out the number of hens the producer has, for he knows that no one with a few hens can save up eggs to make a large shipment without having the greater number of them in a stale condition. It is all important then that the producer should realize the value of and be guided by the following points:—

1. An egg, as soon—after it is laid—as possible should find its way to the consumer.

2. After being taken from the nest, the egg should be kept in a cool, sweet-smelling cellar or cupboard, and the flavour so preserved from contamination.

3. The nests in which the eggs are laid should be clean and free from odours.

4. The food of the fowls should be pure and wholesome.

5. It should be a strict rule to have no male bird with the hens which lay eggs for market. The eggs will so be unfertilized, which is desirable.

6. For breeding purposes in spring time select a suitable number of the best-shaped, best-laying and largest hens, and mate with them a male bird of good type and undoubted worth. These should be kept in separate quarters. When all the eggs desired for hatching purposes have been secured, the male bird should be disposed of and the hens kept in the breeding pen for two weeks longer before being allowed to run with the others. The above plan will do away with the necessity of having several male birds running promiscuously with the laying-hens in order 'to have eggs for hatching.'

THE MOULTING SEASON.

Another cause which to a certain extent may be affecting the usual summer supply of eggs, is the practice, becoming rapidly more common, of having fowls moult in

July, August or September. And in this connection there is another striking instance of rapid development in improved methods. Hardly had summer moulting been shown to be possible and comparatively easy—in the months named—than we had efforts more or less successfully made to shorten the period. The moulting season is one of non-production, during which moulting hens do not lay. It is advisable then to have the season of non-production at a period at which eggs, heretofore, have been at their lowest value, viz., summer. It is also necessary to have hens moult in summer in order to have eggs in winter. It has been a common practice in past years among farmers, and the practice is yet too frequent, to have their hens lay well in spring time, summer and fall, and moult during winter, the period of high prices. With the adoption of the method of having their hens moult in summer may, possibly, come a reduced production of eggs at that season and likely an increased output in winter. In report of last year, while referring to the subject, it was remarked 'that an increased winter supply of eggs and a less number in summer might result in the evening up of prices.' The trend of the markets to-day is towards a much higher summer value. The effect on the winter market of the past two years was not noticeable. Prices were rather higher last winter than ever before.

EFFORTS TO SHORTEN THE MOULTING PERIOD.

The moulting period usually occupies a period of 10 to 12 weeks, extending from end of July to end of September. The proprietor of a large poultry plant in the United States, and who was among the first to practice early moulting, claims to secure satisfactory results in 8 to 10 weeks. His method is to put his fowls at the beginning of July on quarter rations for ten or twelve days, meanwhile, keeping them in limited runs. At the end of this time the fowls are allowed full range and their rations increased to usual quantity. Cut bone, or, boiled livers, &c., &c., are fed, in liberal quantity two or three times per week.

A correspondent, in Nova Scotia, thought that with a diet of boiled and crushed beefheads, grain, grit, a free run, and access to grass, or, vegetables, 6 weeks should be the outside limit of the moulting period.

But developments take place quickly and we now have Mr. James Shackleton in his book on 'System in Poultry Keeping,' making the statement that it is unnecessary that hens should stop laying in order to moult. He says: 'Control of season and duration of moult are possible * * * * Perfect health and condition of fowls, freedom from damp and dirt in houses and absence of lice are essential to any control of moulting.' In a following page will be found full information as to care and treatment of the birds so as to bring on and expedite the moulting period.

DELAY IN RESUMPTION OF WINTER LAYING AFTER MOULTING.

Another interesting phase of poultry keeping which, in connection with summer moulting, has made itself apparent in recent years is delay in the resumption of egg laying after moulting. There seems to be an unnecessary and certainly unprofitable delay in the resumption of laying after the hens have moulted and are seemingly in the very best condition. This delay has also been noticed in early pullets, which show every indication of laying, but do not. A cause for this state of affairs is now engaging the attention of the best authorities on winter egg laying. In relation to the subject, the following quotation from an editorial in 'Farm Poultry' of November 1 last, will be read with interest:—'Soon after November 1 letters will begin to come to us from all quarters and the burden of the refrain of all will be, "Why don't my hens lay?" Each writer will tell how well developed his pullets are, how they have for some time looked as if they ought to lay, how well they are housed, fed and cared for, and how perversely, in spite of all the conditions being right, nature refuses to compel the pullets to produce the proofs of that fact.' Perhaps this delay in

the resumption of winter laying has been more marked in the present season than in any previous one. While there are doubtless causes, yet not apparent, close observation has shown that any of the following too common practices, is deterrant to early winter laying, viz.:—

1. In the case of pullets, neglect in care or feeding which has resulted in their becoming immature.

2. Moving hens or pullets from place to place when winter egg laying is expected. Put the birds into their winter quarters and let them remain in them, undisturbed. A run from pen to limited outside run is beneficial.

3. Overcrowding after being put into winter quarters. This applies to both hens and pullets and is more generally practised than is imagined.

4. Unnecessary exposure of pullets or newly moulted hens to cold fall rains, or, damp quarters.

5. Placing birds, suffering from colds, in laying pens instead of hospital. Neglected colds generally end in roup.

6. Lice infested fowls which, usually, is synonomous with filthy quarters.

7. Pullets from constitutionally weak, poor egg laying, or slow maturing strains of fowls.

8. A mistaken notion of economy which leads to the feeding—to growing pullets—of oats (very often of poor quality) instead of wheat, buckwheat or corn.

9. Hens improperly fed during their moult or allowed to hatch chickens late in the season.

10. Hens which have become overfat from being overfed during, or, soon after moulting.

EARLY HATCHED PULLETS TO THE RESCUE.

For the scarcity of eggs during the months of September, October and early part of November, and which has already been commented on, the practical remedy seems to be early-hatched pullets. In order to have pullets laying in these months they would require to be hatched out in April and early May at the very latest. Farmers should certainly have no difficulty in having them at that time. Experience has shown that to have pullets laying in July or August would necessitate their being hatched in January or February, and by artificial means, for it would be almost impossible to get broody hens at that season. For this reason, pullets so hatched are not likely—for some time to come, at least—to be as numerous as those later hatched. Records of our department show the following dates at which early artificially-hatched and reared pullets began to lay :—

1. Brown Leghorn pullet, first egg in July 17, when 4 months and 20 days old.

2. Two White Plymouth Rock pullets, first eggs on July 28, when 5 months of age.

3. A Cross-bred pullet, on July 28, when 5 months old.

4. A W. P. Rock pullet, on August 1, when 5 months and 3 days old.

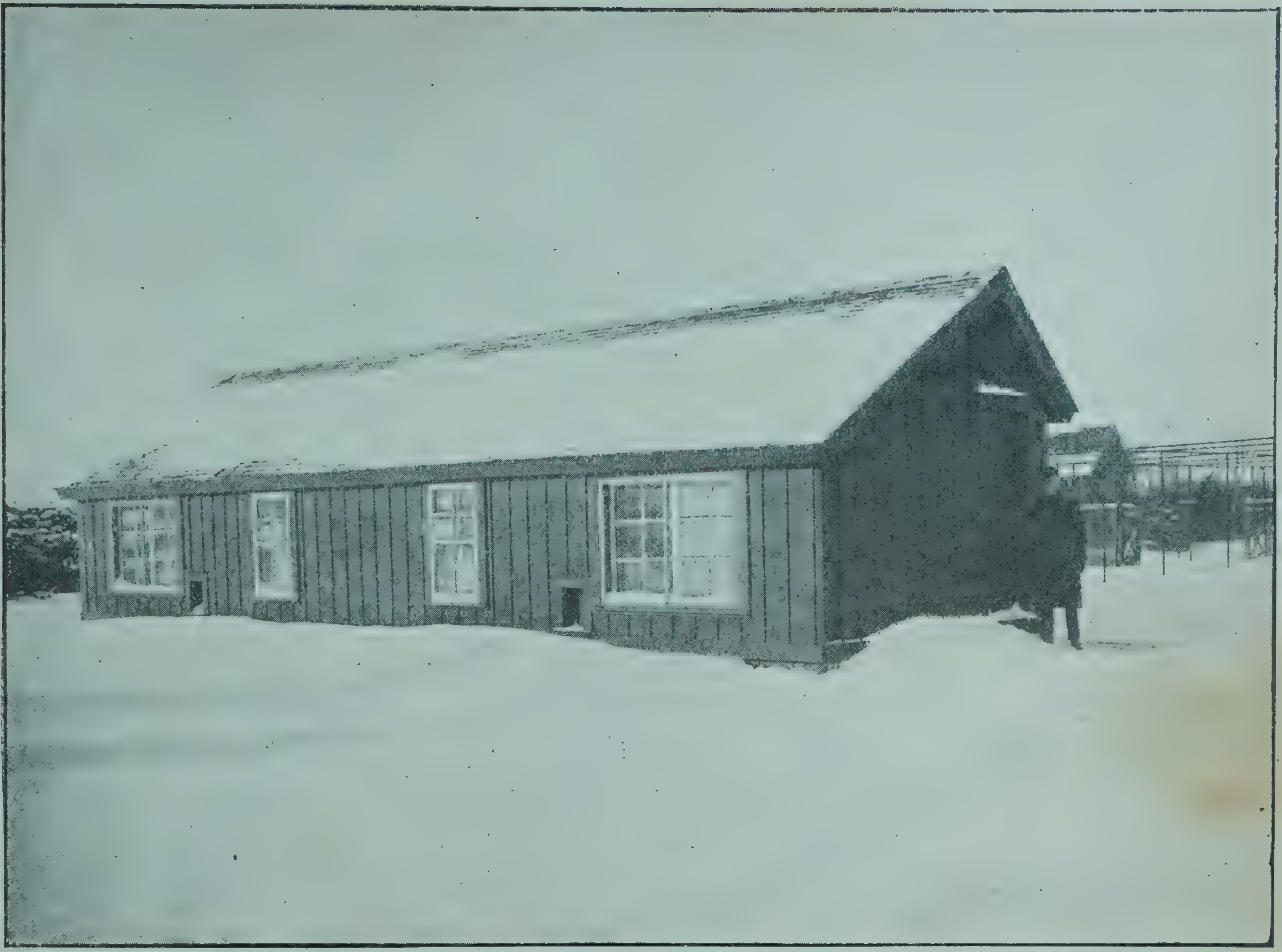
On another occasion several Barred P. Rock pullets hatched on March 26, began laying when 5 months of age, which would be at the end of August.

April and early May pullets laid at different dates in late September and October. Some of these were hatched by hens and others by incubator.

WHAT EXPERIENCE HAS SHOWN RELATIVE TO EARLY PULLETS.

Experience in connection with the hatching of pullets, intended for early layers, leads to the following conclusions :—

Pullets to prove early layers should come from hens which have shown themselves to be early and prolific layers.



(By Frank T. Shutt.)

EXPERIMENTAL FARM NEW POULTRY HOUSE, WITH SHED ATTACHMENT,
SHOWING WINDOWS *closed* DURING HEAVY SNOW STORMS, AT NIGHT, OR ON VERY COLD DAYS.
WINDOWS FACE SOUTH.

(By Frank T. Shutt)

SAME POULTRY HOUSE, SHOWING WINDOWS OF SCRATCHING SHED *open* ON FINE BRIGHT DAYS.
THROUGH WINDOWS CLOSED OR OPEN SUNSHINE HAS EASY ACCESS TO INTERIOR.
WIRE NETTING IN FRONT OF WINDOW.

To make fall layers, pullets should not be hatched out later than second week in May. Pullets should be gently pushed from time of hatching.

Early-hatched pullets should not be fed too much stimulating food, or they will begin to moult instead of laying.

Pullets intended for early layers should have a separate run and not be crowded.

Some strains mature much more quickly than others. This applies to all varieties.

Where eggs only are desired, a pullet from one of the Leghorn, Andalusian, Minorca or Hamburgh breeds will be found to make rapid maturity.

Where early egg-laying and flesh development are required, one of the Plymouth Rock, Wyandotte, Orpington, Dorking or Faverolle varieties will be found suitable.

Every effort should be made to hatch chickens from none but the best strains, *i.e.*, the most prolific egg-layers and best market types. This may entail some extra trouble, but it is necessary to ensure the beneficial results, almost, sure to follow.

ARE FOWLS AS GOOD LAYERS ONE SEASON AS ANOTHER ?

This is a question of great import. It is an interesting feature of poultry-keeping worth inquiring into. Records of egg-laying by pullets and hens in our department, extending over eight years, go to show that pullets which laid well during their first winter did not make as good layers the next, when hens. It was also shown that pullets which were poor layers during their first winter season did remarkably well when hens the next one. If the experience in the first instance was not offset by that of the second, it would go far to warrant the practice, on the part of many poultry keepers of holding their pullets for only one year and then disposing of them. Doubtless it will take the results of several years, yet to come, to confirm or modify the experience already noted, but meanwhile it is a phase of modern poultry-keeping worthy of remark as having made itself conspicuous on more than one occasion.

REASONS WHY FOWLS SHOULD BE KEPT LONGER THAN THEIR FIRST YEAR.

While the practice of keeping pullets for only one year has many advocates and some good features, experience has led to the conclusion that its general adoption is not advisable in the poultry interests of the country, for the following reasons, viz.:—

Pullets, as a rule, do not lay as large eggs as they do when they are hens.

The larger egg of the hen receives the better price and is preferred by city dealers.

Hens are preferable for breeding stock, for a pullet is admittedly an immature fowl. Writing recently on this subject, an eminent breeder strongly advises, 'that the breeding pen should always be composed of two-year-old hens of undoubted merit.'

At twelve months of age a fowl is not old enough to prove her worth as an egg-layer, or as being of suitable market type.

EXPERIMENTAL WORK OF THE YEAR.

Preparation for winter work began (as it should do in every case) in the fall. By the end of September last a number of the laying stock were well over their moult; a month later found them all in new feather and good condition. As in previous years care was taken to avoid getting these prospective winter layers in an overfat condition, which, through a desire to hasten winter laying by too heavy feeding, is often done. As noted in a previous page there is apt to be a tantalizing delay from the time the layers complete their moult until they recommence laying. It is likely, as a result of the improved methods now in vogue, that this interregnum will be shortened, and in the near future.

On November 10 the cold weather set in and the fowls went into their winter quarters. The different breeds were culled of undesirable specimens and were arranged in the pens of the different poultry houses as shown on page 255 of report of last year, 1903. As far as possible the pullets and older hens were placed in separate

buildings in order to permit of a correct egg record being kept. When arranged according to varieties, or, breeds the fowls presented a healthy and pleasing appearance, the result doubtless of their having the benefit of outside run until closed in.

THE INTRODUCTION OF SUPERIOR BREEDING STOCK.

On December 15 several new males and females of superior quality and appearance were added to those already in stock. The male birds which had been purchased at the Guelph Fat Stock Show, held in the beginning of the month, were exceptionally fine breeding stock and as they were mated with selected females, their progeny were unusually good. Those persons who purchased eggs from the hens of these matings last spring, could not have failed to be pleased at results, where good hatches were secured.

WHEN THE PULLETS BEGAN TO LAY.

The pullets of the different varieties began to lay as follows:—

White Wyandotte pullet, November 8.
Buff Orpington pullet, November 11.
Jubilee Orpington pullet, November 11.
Silver Grey Dorking pullet, November 12.
Cross-bred pullet, November 20.
Barred P. Rock pullet, November 26.

FIRST HENS TO LAY AFTER MOULTING.

The following hens were the first to resume laying after moulting:—

White P. Rock hen on November 6.
Rhode Island Red hen on November 7.
Barred P. Rock hen on November 9.
White Wyandotte hen on November 11.
Buff P. Rock hen on November 11.

By the middle of the month (December) winter laying had become general. The weather was unusually cold and during the holiday season—at the end of the month—the demand for new laid eggs was very great with a rather limited supply, probably due to the early and continued severity of the weather.

EXPERIMENTAL RATIONS AND THEIR EFFECT.

In order to ascertain their worth as winter egg producers and their effect on the health of the fowls, a number of simple and cheap rations, such as could easily be procured on the farms of the country, were made up and fed to groups of birds of different ages in manner, quantity and frequency, as follows:—

Pen No. 1 was composed of 10 Barred Plymouth Rock hens of one, two and three years of age. Their rations were:—

A.M. ration—¾ lb. of grain—½ wheat, ½ oats.

Noon ration—1 lb. of mash, composed of ⅓ shorts; ⅓ ground oats; ⅓ gluten meal.

P.M. ration—Same as morning.

The result in eggs during the months named was as follows :—

1903.

November	19
December	37

1904.

January	54
February	25
March	82
April, up to 7th instant, inclusive	19
	236

A fire which occurred in the main poultry building on the morning of April 8 necessitated the immediate liberation of the birds and they became for the time-being unavoidably mixed. This mishap prevented the continuation of the test beyond the date given. The experiments have been resumed this season under similar conditions.

Pen No. 2, composed of 10 one, two and three-year old Barred Plymouth Rock hens were fed, as follows :—

A.M. ration—10 ozs. of grain, of which ⅓ was oats and ⅔ wheat.

Noon ration—3 days of the week 10 ozs. of mash of same composition as in No. 1 pen. Remaining 4 days, 10 ozs. of cut bone in lieu of mash.

P.M. ration—Same as morning ration.

Result in eggs was :—

1903.

November	10
December	48

1904.

January	65
February	37
March	98
April, up to 7th instant, included	26
	284

Pen No. 3 contained 10 White Plymouth Rock hens one and two years of age. Their food was :—

A.M. ration—¾ of a lb. of wheat.

Noon ration—¾ lb. cut bone and 2 lbs. beets on alternate days.

P.M. ration—¾ lb. wheat.

Number of eggs laid :—

1903.

November	25
December	31

1904.

January	32
February	21
March	62
April, up to 7th instant, inclusive	26
	197

Pen No. 29 was composed of 9 pure-bred hens of different varieties. Their rations numbered only two per day and were :—

A.M. ration—¾ lb. of grain, viz., ⅔ wheat and ⅓ oats.
P.M. ration— " " " "
Every day 1 lb. of beets.

Number of eggs laid :—

1903.

November	2
December	41

1904.

January	33
February	30
March	82
April, up to 7th instant, inclusive	5
	193

Pen No. 30, composed of 9 pure-bred pullets of different varieties. Their rations were two per day, viz.:—

A.M. ration—¾ lb. grain, composed of ⅔ oats and ⅓ wheat.
P.M. ration— " " " " "
1 lb. mangels every day

Result in eggs was :—

1903.

December	29

1904.

January	28
February	19
March	61
April, up to 7th instant, inclusive	19
	156

Pen No. 31, contained 9 pullets of Barred P. Rock and Brown Leghorn cross. Their rations were fed twice per day :—

A.M. ration—¾ lb. grain, composed of ⅔ oats and ⅓ wheat.
P.M. ration— " " " " "
1 lb. of roots every day.

Number of eggs laid were :—

1903.	
November	12
December	64
1904.	
January	107
February	50
March	90
April, to 7th instant, inclusive	18
	341

CONTINUED INVESTIGATION INTO CAUSES OF WEAK GERMS IN EARLY SPRING EGGS.

For several years past experiments have been conducted with the object of ascertaining the cause of so many weak germs in eggs laid in early spring. The weak germs directly affect the profitable hatching and rearing of early chickens. It is, therefore, important to discover the cause, or causes, and remedy, if possible. The fowls under observation were in two groups and kept under the following conditions :—

GROUP 1.—Hens were kept in artificially warmed compartments.

They had laid fairly well from early December.

They had been gently stimulated to lay by generous feeding.

They were in numbers of 10 to 15 in pens, each 8 x 14 feet dimensions.

They were confined to these pens from early winter until spring weather permitted their getting to outside runs.

Results noted were :—

That the germs of the eggs from these hens were so weak as to die in large numbers in progress of incubation. Chickens when hatched were weak.

That the germs remained weak until the hens had opportunity, in spring, to get to outside runs and recuperate.

That the germs apparently became strong about the middle of April, and when set at, or, after that time, gave good results. See reports of previous years.

GROUP 2.—The hens in this group were in cold quarters, which were two rough divisions of a shed. Into this shed there was opportunity for limited run.

Eggs from these hens were collected soon after being laid, or they would have been frozen.

The hens were heavily fed and laid exceedingly well.

The germs of the eggs laid by these hens, in early spring, were strong and hatched 9 and 10 chickens per setting of 13 eggs. The chickens grew well.

The hens were mated with vigorous cockerels.

Results were considered in favour of fresh air and plenty of it even if it was cold.

Similar experience on the part of farmers and poultry-keepers has led to the more general adoption of the poultry-house with scratching shed attachment. Illustrations and descriptions of poultry-houses so constructed, are shown in reports of poultry department for 1902 and 1903. In these reports will also be found details of the experimental work carried on, up to that time, in connection with the germination of eggs laid in early spring.

INCREASED OPPORTUNITY FOR FURTHER INVESTIGATION.

In order to permit of further examination into this important phase of poultry-keeping, a poultry-house of moderate dimensions with scratching room attachment and arranged and fitted in the latest and most approved methods, was erected during

the past summer in close proximity to our main poultry building. A brief description of this poultry house is as follows:—

Size of building, including scratching sheds, outside measurement, 12 x 40 feet. Size of roosting rooms, inside measurement, 8 x 9·6 feet. Size of scratching sheds, inside measurement, 11 x 9·6 feet.

The walls of the building are of 2 x 3-inch studding, covered with rough boards and matched lumber with tarred paper between and battens on joints. The roosting rooms, inside walls and ceilings are sheeted with rough lumber. The partitions between roosting rooms and scratching sheds are also sheeted with two-ply rough boards with tarred paper between.

The floors of the roosting rooms, one scratching shed and passageway are of concrete. The floor of the remaining scratching shed is of sand placed on a foundation of twelve inches of rough stones. The building is painted on the outside and in the passageway inside with two coats of paint; on the other parts inside are two coats of whitewash.

A building of similar size and calculated to give almost equally good results could be constructed of rough lumber, and a floor of rough boards or earth take the place of the concrete. Whitewash could also be used on the outside in lieu of paint. The estimated cost of such a building would be about $2.75 per running foot, the lumber being calculated at $15 per thousand and shingles at $3 per thousand.

ARTIFICIAL AND NATURAL INCUBATION—HATCHING CHICKENS AT DIFFERENT SEASONS AND RESULTS.

The work of examination into the strength of germs in eggs laid early in spring was continued last season. During the winter the male birds had been placed with the hens in Nos. 1 and 3 houses.

On February 20 last, the first incubator was filled. In previous years hens were mainly used as hatching and rearing mediums, but last season artificial hatching and brooding were generally adopted. With the object of comparison as hatching mediums a certain number of hens were used. Experience of past years has clearly shown that where mid-winter or early spring experimental work is carried on in the testing of the fertility and strength of the germs of eggs, or, hatching of chickens, artificial means are indispensable for hens as hatching mediums are impossible to be obtained in requisite numbers at that season.

When the hatching and rearing of broilers for the spring market is carried on as it is by many establishments, operations generally begin early in December or January. In such cases incubator room and brooding house or houses are imperative means to an end. In the following details of the operating of incubators of various patterns at different times and conditions, much that is interesting and instructive may be learned. To the beginner the results shown from the cooling of the eggs at shorter or longer periods according to the season; the number of times and regularity with which the eggs were turned; ventilation of the incubator; supply or non-supply of moisture; temperature of operating room (which was not well adapted for the purpose) and of the incubators and other details, cannot fail to be useful, because so much inquired about. It was not intended to have a competition of incubators of different designs, for in operation of them, our own methods of manipulation were adopted and were largely experimental. The different tests and results are given in the following tables:—

No. 1 Test.—Prairie State Incubator. Hot Air.

Filled on February 20, 1904, with eggs in quality and kind as follows:—

Description of Eggs.	No. of Eggs.	Clear Eggs 1st Test.	Dead Germs 16th day.	Chicks dead in Shell.	Chickens Hatched.
Silver Laced Wyandottes	20	3	7	2	8
Buff Orpingtons	14	3	8	3	0
Silver Grey Dorkings	14	2	8	0	4
Faverolle	12	2	3	4	3
White Wyandottes	9	2	7	0	0
Barred P. Rock (No. 2 pen)	8	0	3	3	2
Black Hamburg	7	3	4	0	0
White Plymouth Rock	6	0	0	0	6
Total	90	15	40	12	23

Birds had all the same care and feeding.
Incubator was operated in the office, the atmosphere of which was very dry.
Variation of temperature in room during hatch was from 25 to 30 degrees.
No moisture was used in either machine or room.
Time of cooling the eggs was:—
1st week 10 to 12 minutes.
2nd week 15 to 20 minutes.
3rd week 25 to 30 minutes.
Door of incubator was left open during the cooling of the eggs.
Eggs were turned once per day after cooling.

Test No. 2.—Chatham 'Red Bird' Incubator. Hot Air.

Filled on February 27, 1904, with eggs as follows:—

Description of Eggs.	No. of Eggs.	Clear Eggs 1st Test.	Dead Germs 16th day.	Chicks dead in Shell.	Chickens Hatched.
Buff Orpington	16	4	5	2	5
Silver Grey Dorkings	16	1	8	3	4
Silver Laced Wyandottes	15	2	2	1	10
White Wyandottes	11	3	6	1	1
Faverolle	11	3	3	3	2
Barred P. Rock	13	0	3	4	6
Black Hamburg	8	2	6	0	0
Black Minorcas	5	1	4	0	0
White P. Rock	5	2	2	1	0
	100	18	39	15	28

Birds were kept under same conditions with exception of Barred and White P. Rocks which were under experiment.

Incubators were placed in same office as No. 1.

Temperature of room and time of cooling the eggs same as No. 1.

Water was constantly kept in moisture pan.

TEST No.3.—CYPHERS INCUBATOR (220-EGG SIZE). HOT AIR.

Filled on March 5, 1904, with following eggs:—

Description of Eggs.	No. of Eggs.	Broken by Accident.	Clear —1st Test.	Dead Germs.	Dead in Shell.	Chickens Hatched.
Buff Orpington	43	4	8	13	5	13
White Wyandotte	32	2	12	9	2	7
Silver Grey Dorkings	27	0	5	18	1	3
White Leghorn	23	0	2	13	7	1
Barred P. Rock	20	0	1	10	5	4
Black Minorca	16	0	2	7	3	4
Rhode Island Reds	12	0	2	6	4	0
Faverolle	10	0	2	5	1	2
Silver Laced Wyandotte	16	0	1	3	2	10
Black Hamburg	10	0	1	5	2	2
Jubilee Orpington	8	0	2	6	0	0
Buff Leghorns	7	2	1	1	0	3
White Plymouth Rock	4	0	1	2	0	1
S. Spangled Hamburg	2	0	0	2	0	0
	230	8	40	100	32	50

Incubator was placed in same office as Nos. 1 and 2, with similar variations of temperature.

Time of cooling eggs same as Nos. 1 and 2.

TEST No. 4.—DESMOINES (HOT WATER) INCUBATOR. 260-EGG SIZE. FILLED APRIL 26, 1904.

This test and the following one was conducted in a new building erected as a result of the fire previously referred to. The incubator was filled with the following eggs:—

Description of Eggs.	No. of Eggs.	Accidentally broken.	Clear 1st Test.	Dead Germs.	Dead in Shell.	Chickens Hatched.	Remarks.
Barred P. Rock	38	1	5	8	1	23	
White Leghorn	45	2	5	5	3	30	
B. P. R.—Bro-Leghorn Cross	22	0	8	1	0	13	
Silver Grey Dorking	21	0	8	1	0	12	
White Wyandotte	18	0	3	2	1	12	
Buff Orpington	14	0	5	4	1	4	
White Plymouth Rock	15	1	0	4	0	10	
White Wyandotte Cross	14	0	0	3	0	11	
Jubilee Orpington	9	0	0	2	0	7	
Light Brahma	10	1	2	1	1	5	
Black Hamburg	10	1	2	1	0	6	
Silver Laced Wyandotte	5	0	0	0	0	5	
Faverolle	6	0	2	0	1	3	
Black Minorca	3	0	0	0	0	3	
S. Spangled Hamburg	7	0	1	2	0	4	
	237	6	41	34	8	148	

Eggs were turned twice per day, the first at cooling time and once afterwards.

Ventilators half open, all the time.

Doors of the incubator were left open all the time of cooling.

No. of days.	Temp. of Room. A.M.	Temp. of Room. P.M.	Temp. of Incubator. A.M.	Temp. of Incubator. P.M.	Time of Cooling.	Remarks.
1	52	58	92	102		
2	58	58	102	102		
3	57	67	102	102		
4	58	64	102	102	10 minutes.	1st cooling and turning a.m.
5	54	64	102	103	12 "	
6	60	80	103	103	12 "	1st test.
7	65	82	103	103	14 "	
8	52	85	103	103½	14 "	
9	56	80	102	103	15 "	
10	56	74	102	104	15 "	
11	61	84	103	104	15 "	
12	67	81	103	103	15 "	
13	66	87	102½	104	20 "	
14	59	78	102	103	30 "	
15	63	70	103	103	30 "	
16	55	75	103	103	30 "	
17	59	83	102½	103	30 "	Last test.
18	58	84	103	104	30 "	
19	67	61	103	103	35 "	Last cooling.
20	60	64	103	103		
21	56	78	103	103		

TEST NO. 5.—CYPHER'S INCUBATOR (220-EGG SIZE). HOT AIR.

Filled on May 14, 1904, with following Eggs. Machine was operated in new building for reason explained in No. 4.

Description of Eggs.	No. of Eggs.	Clear Eggs.	Dead Germs.	Dead in Shell.	Chickens Hatched.	Remarks.
Barred P. Rocks	31	14	0	2	15	
Buff Orpington	26	5	3	1	17	
White Plymouth Rock	21	0	5	4	12	
Black Hamburg	15	2	5	4	4	
B. P. R.—Brown Leghorn Cross	16	5	1	0	10	
White Wyandotte	15	8	1	2	4	
Silver-Laced Wyandotte	12	3	3	1	5	
Faverolle	11	4	2	2	3	
White Leghorn	14	1	3	1	9	
Light Brahma	11	5	4	1	1	
Black Minorca	7	1	1	1	4	
S. Spangled Hamburgs	7	2	4	0	1	
Buff P. Rocks	5	0	1	1	3	
Silver Grey Dorking	9	2	0	1	6	
	200	52	33	21	94	

Eggs were turned twice per day.
Ventilators half open all the time.
During the time of cooling eggs the incubator doors were left open.

Days.	Temp. of Room. A.M.	Temp. of Room. P.M.	Temp. of Incubator. A.M.	Temp. of Incubator. P.M.	Time of Cooling Eggs.	Remarks.
1	.....	84	.....	103		
2	67	61	103	103		
3	60	64	103	103		
4	56	78	103	104¼	15 minutes.	1st cooling of eggs.
5	57	78	103	103	25 "	
6	60	65	103	103	25 "	1st test.
7	62	72	104	103	25 "	
8	63	84	104	103	30 "	
9	68	67	103	103	30 "	
10	66	76	103	103	30 "	
11	69	88	104	104	30 "	
12	70	72	104	103½	28 "	
13	68	83	104	103	45 "	
14	66	84	103	103	45 "	
15	56	76	104	103⅓	45 "	
16	58	78	103½	103½	40 "	Last time of testing.
17	60	76	103½	103	45 "	
18	54	71	103	103	45 "	
19	60	69	102	103	45 "	Last time of cooling.
20	60	71	103	103½		
21	71	76	103	103		

TEST No. 6.—FOUR HENS AS HATCHING MEDIUMS.

On April 20, 1904, they were given 13 eggs each of the following kinds:—

Description of Eggs.	No. of Eggs.	Clear —1st Test.	Dead Chicks in Shell.	Chickens Hatched.
S. G. Dorking	8	3	0	5
White Leghorn	8	0	3	5
B. P. R.—Brown Leghorn Cross	4	1	0	3
Black Hamburgs	3	0	0	3
Buff Orpington	3	0	0	3
White Wyandotte	5	1	0	4
Barred P. Rock	5	1	0	4
Faverolle	3	0	0	3
Jubilee Orpington	3	1	1	1
White Plymouth Rock	2	0	0	2
S. Spangled Hamburg	2	0	0	2
Buff Plymouth Rocks	2	0	0	2
Light Brahmas	1	1	0	0
Black Minorcas	3	1	0	2
Totals	52	9	4	39

TEST No. 7.—In which a number of hens were used as hatching mediums. They were set at different times during May, 1904, on the following eggs:—

Date when set.	Description of Eggs.	No. of Eggs set.	Clear —1st Test.	Dead Germs.	Dead Chicks in Shell.	Chickens Hatched.
1904.						
May 2	Light Brahmas	10	2	0	2	6
" 5	Buff Leghorns	36	10	1	1	24
" 5	Black Minorcas	52	10	8	10	24
" 7	White Wyandottes	60	17	5	6	32
" 14	S. G. Dorking	15	3	2	3	7
" 14	Faverolle	15	3	1	1	10
		188	45	17	23	103

The number of clear eggs on May 2, 5 and 7, goes to show that the birds, in the latter part of the month of April when the eggs were collected, had not completely recovered from the effects of the fire which occurred on the 8th of the latter month. Later, the percentage of clear eggs, it will be noticed, is very much less.

MANAGEMENT OF THE SITTING HENS.

The following has been found a convenient and effective method in managing the sitters. As the hens became broody they were put in wooden cases of suitable size and without bottoms, which were placed in pens by themselves. The boxes had

hinged doors in front so as to be opened, or closed as required. Comfortable nests were made of dry lawn clippings, or oat straw. Previous to putting a hen on her nest she was thoroughly dusted with insect powder and so was her nest. Experience has proved that lice infested hens are not successful sitters. The hens are allowed to sit for twenty-four and thirty-six hours on three or four china eggs. Having proved themselves reliable sitters the imitation eggs were removed and they were replaced by the valuable eggs. Borrowed sitters should always be so treated for they are generally infested with vermin and a source of contamination to nest and premises they happen to be placed in. Grain of different kinds mixed, grit and drink water were always before the sitters.

HOW LONG DOES THE EFFECT OF FERTILIZATION LAST.

Two interesting experiments, particulars of which are given in the two following tables, were made at the conclusion of the breeding season last summer. The objects aimed at were:—

1. To find out how long after the removal of the male bird from the breeding stock was fertilization strong enough to hatch out into a healthy chicken.

2. How long after the removal of the male bird could the effect of fertilization be traced ?

The questions are answered by the results in the following tests 8 and 9.

TEST NO. 8.—With seven Barred P. Rock hens from which the male bird was separated on June 29, 1904. On the same day eggs were put into an incubator and thereafter, from time to time during twenty days. Details are:—

Date.		No. of days male bird separated from hens.	No. of eggs set.	Clear eggs. — 1st test.	Dead germs.	Dead in shell.	Chickens hatched out.	Remarks.
1904.								
June	29..	......	3	1	1	......	1	Strong chicken.
"	30..	1	1	1	......	......	....	No results from this egg as it was clear.
July	1..	2	3	1	....	......	2	Strong chicken.
"	2..	3	3	1	......	......	2	"
"	3..	4	2	1	......	......	1	Weak chicken.
"	4..	5	2	1	......	......	1	Healthy chicken.
"	5..	6	3	1	......	......	2	"
"	6..	7	1	1	......	... .	......	Egg without germ ; no result.
"	7..	8	1	......	1	......	.....	Germ dead from weakness.
"	8..	9	1	1	... .	......	......	Egg not fertilized ; no result.
"	9..	10	1	......	.....	1	......	Chicken partly developed ; dead from weakness.
"	10..	11	......	......	......	....	.....	No eggs laid this day.
"	11..	12	1	......	......	1	.....	Chicken dead in shell evidently from weakness.
"	12..	13	1	1	......	......	......	Egg without germ ; no result.
"	13..	14	......	......	......	......	......	No egg laid this day.
"	14..	15	2	2	......	......	......	Eggs without germs ; no results.
"	15..	16	1	1	......	......	......	" "
"	16..	17	2	2	......	......	......	" "
"	17..	18	......	......	......	......	......	No eggs laid this day.
"	18..	19	1	1	......	......	......	Eggs without germs ; no results.
"	19..	20	1	1	......	......	......	" "
"	20..	21	1	1	......	......	......	" "
			31	18	2	2	9	

Test No. 9.—With five White Leghorn hens. Cock bird separated from hens on June 23, 1904. Eggs put into incubator five days later and thereafter for twenty days. Details are as follows:—

Date.	No. of days male bird separated from hens.	No. of eggs set.	Clear eggs.—1st test.	Dead germs.	Dead in shell.	Chickens hatched out.	Remarks.
1904.							
June 28..	5	4	2	......	......	2	Strong chickens. Eggs laid 5 days after removal of male bird from hens.
″ 29..	6	3	1	1	.....	1	Strong chicken.
″ 30..	7	4	1	......	......	3	Strong, healthy chickens. Male bird away from hens seven days.
July 1..	8	2	......	......	1	1	Strong, healthy chick. Male bird away from hens eight days.
″ 2..	9	3	.....	.....	....	3	Chickens weak; had to be helped out of shells.
″ 3..	10	2	......	......	......	2	Fairly strong and healthy. Male bird away from hens ten days.
″ 4..	11	3	2	......	......	1	Weak and infirm. Male bird away from hens eleven days.
″ 5..	12	1	1	......	......	......	Egg without germ. No eggs with germs after this date.
″ 6..	13	2	2	......	......	......	Eggs without germ.
″ 7..	14	2	2	.....	.....	.....	″
″ 8..	15	1	1	.....	.....	.....	″
″ 9..	16	2	2	.....	.....	...	″
″ 10..	17	......	......	.....	......	.....	No eggs laid this day.
″ 11..	18	.....	.....	......	.....	......	″
″ 12..	19	1	1	.....	......	....	No germ in egg.
″ 13..	20	1	1	.....	..	.....	″
″ 14..	21	1	1	......	..	.....	″
″ 15..	22	1	1	.....	......	...	″
″ 16..	23	3	3	.....	...	....	″
″ 17..	24	1	1	.....	...	.....	″
″ 18..	25	3	3	......	...	.....	″
		40	25	1	1	13	

It is interesting to note the result of the two tests. In the first test, No. 8, fertilization was strong enough in 6 eggs laid on the 5th day, after removal of the male bird from the breeding pen, to hatch out two healthy chickens. The last trace of fertilization is found in an egg laid eleven days after removal of the male bird. Examination of this egg, in course of incubation, showed a fairly well developed chicken dead in the shell. It had evidently died in progress of development from weak germination. No further evidence of fertilization is found in this test.

In the second case, test No. 9, strong chickens are hatched from eggs laid on the eighth day after removal of the male bird and fairly strong and healthy chicks from eggs laid on the tenth day after separation. From the three eggs laid on the eleventh day after separation a weak and infirm chicken was hatched. After this there is no trace of fertilization. Results seem to endorse the advice given in reports and correspondence of previous years, to the effect that it is not advisable to set eggs for hatching which are laid on or after the fifth day of removal of male from breeding stock.

Another interesting result which made itself evident was the comparative unimpaired condition of the unfertilized eggs at the conclusion of the 21 days' tests. These unfertilized eggs were taken from the incubator on the 22nd day, after they were put into the machine. During that time they were subject to the ordinary temperature of 103 degrees of heat usually maintained for the hatching of chickens from fertilized eggs. On examination, these unfertilized eggs were found to be in as equally good condition and flavour—if not better in numerous instances—than the majority

of midsummer eggs. This strongly emphasizes the advice so frequently given in previous reports and repeated in a previous page of this one—'that farmers should make it a rule to keep no male bird with the hens which lay the eggs to be taken to market, or, sold to store or middleman.' This experience in relation to the superior keeping quality of unfertilized eggs is by no means a new one in our department. On the occasion of the two tests described above there was good opportunity for extended and correct examination and the results which were so evident in so many cases, not only go to prove the correctness of previous advice, but should be a useful warning to all who are desirous of obtaining the highest price 'for the strictly new laid egg with flavour intact,' more particularly in summer time when conditions for germ development are so favourable.

CARE AND TREATMENT OF THE CHICKENS.

On the chickens hatching out they were allowed to remain in the incubators for 36 or 48 hours—until strong on their legs. If hatched by hens they were allowed to remain under their mothers for the same length of time. The incubator chicks were placed in brooders heated to 95 degrees. If season permitted the brooders were placed on the grass outside and the hens with their chickens were removed to small coops, also on the grass. Each of these coops had a slatted front through which the chicks could run out and in at pleasure. The brooders containing the incubator-hatched chickens were placed in small yards surrounded by portable wire netting fences of light construction. From time to time the brooders and wire fences were moved to new locations, until the chickens were old enough to run at large. When too large for the brooders the chickens were placed in colony houses situated throughout the fields allotted to the department. The same treatment was extended to the hen-hatched chickens on their attaining sufficient size to warrant their removal.

The growth of the chickens was satisfactory. Their rations and treatment were as follows:—First two days, stale bread crumbs and stale bread soak in milk and squeezed dry, the former principally for the first day. On the second or third day granulated oatmeal was given in addition. This may be varied with rice boiled dry, or cracked wheat. After a few days growth finely crushed corn has been found beneficial and was eaten with avidity. A mistake sometimes made is to overfeed the chickens during the early days of their life. As the chickens grew a mash composed of shorts, cornmeal, stale bread and a small quantity of beef scraps or meat meal was mixed with hot milk or water and when cool was fed 3, 4 or 5 times, as occasion required. Small potatoes were sometimes boiled and added to the mash with benefit. Cut bone in small pieces and fed in small quantity at first and after 14 days is one of the best stimulants to vigorous growth that can be given. So are boiled liver and raw onions cut up fine and mixed. In some cases water was furnished from the first day of the chick's life. In others, more particularly the brooder-raised chicks, no water was given at all, the moisture in the milk-soaked bread being considered sufficient. No apparent difference as a result was evident. Grit, from the first was at all times within reach of the youngsters. As the chickens increase in growth the mash was made of as economical and wholesome ingredients as could conveniently be got hold of. Whole grain, principally wheat, was given after the twelfth or fourteenth day, and was gradually increased in proportion as the first and more dainty rations were reduced. The chickens were fed regularly, and while gently pushed, none of their soft food was allowed to remain uneaten, turn sour, or become soiled.

Fed and treated as outlined the weight development of the cockerels of the utility varieties was equal to that of previous years, the average of five years being 1 lb. weight development per month at and after three months of age. The experience of many years has shown with no uncertain results, that with healthy breeding stock carefully fed and cared for chickens, the farmers of the country should find no difficulty in having a pair of Plymouth Rock, Wyandotte, Dorking, or Orping-

ton (the last a comparatively new comer) cockerels, weigh 4 lbs. each, or 8 lbs. per pair, at the end of four months. The latter age is mentioned because it is not so easy to find a pound development per month at an earlier age (in the majority of cases), not because it is unattainable, but for the reason that proper effort is not made to secure such a result.

MANAGEMENT OF MATURING COCKERELS.

On the young cockerels, particularly those of the Mediterranean classes, maturing, they were removed to quarters by themselves, or, they would have annoyed the growing pullets by their precocious attentions.

The larger chickens were also removed from the younger ones when circumstances permitted. This is certainly advisable, for unless removed the older chickens are apt to eat most of the food, and the younger ones are so deprived in great part, if not altogether, of the nourishing food when they most require it. This applies with particular force to late chickens which need to be pushed.

SALE OF BREEDING BIRDS.

During the fall and early winter, a number of Barred and White Plymouth Rock, White Wyandotte and Buff Orpington cockerels were picked out and purchased by farmers and others. It is gratifying to state that the demand was in excess of the supply and may be regarded as evidence of the growing preference by the farmers of the country for birds of good quality and correct market type. There was an equally good demand for eggs for hatching purposes, in early spring and summer, from many different parts of the Dominion.

WEIGHT OF EGGS LAID BY FOWLS OF VARIOUS BREEDS.

Variety.	Number of eggs.	Weight.	
White Wyandottes (selected stock).......	Per dozen,	1 lb.	13 oz.
" (ordinary stock)	"	1 "	9 "
Black Minorcas (selected birds)..........	"	1 "	12 "
" (ordinary birds)	"	1 "	9 "
Buff Orpington (selected stock)........	"	1 "	13¾ "
" (ordinary)	"	1 "	9 "
Light Brahmas (ordinary)	"	1 "	10¼ "
Black Hamburg (ordinary)...........	"	1 "	8½ "
Barred P. Rock (ordinary)	"	1 "	8½ "
Faverolle (ordinary)................	"	1 "	8¼ "
Silver Grey Dorking (ordinary)	"	1 "	7½ "
Silver Laced Wyandotte (ordinary)......	"	1 "	7 "
White P. Rock (ordinary)	"	1 "	7 "
White Leghorns (ordinary)	"	1 "	7 "
Brown Leghorns (ordinary)..........	"	1 "	4½ "

GENERAL ADOPTION OF TRAP NESTS.

It will be noticed from the foregoing enumeration of the weight of eggs that in several instances they are not as heavy per dozen as outside records have shown. This may be accounted for that on the latter occasions the largest eggs were most likely picked out. In the foregoing table the eggs were taken and weighed as they came, except where it is stated that they were from birds selected, not because they were layers of eggs of extra large size, but for their good all-round points. The Wyandotte and Orpington fowls were picked out because they were of correct market types as well as good layers. And to have this combination should certainly be the aim of every

breeder of the utility varieties. With the view of ascertaining which hens in our poultry houses are the best layers of the largest eggs, trap nests of various patterns have been fitted in the different pens. A few years ago experiments were conducted in our department with trap nests in a rather limited way, but sufficient to show that their use, on a large scale, necessitated increased assistance in order that the work should be correctly done. It is hoped by the more general adoption of trap nests, on the present occasion, to obtain such correct records as will result in the building up of prolific and large egg-laying strains in all varieties and in the case of utility breeds in combination with the best market types. Without such systematic procedure, experience has shown, that all other effort in the same direction is likely to be of a more or less haphazard nature.

THE POULTRY EXHIBIT AT THE CENTRAL CANADA FAIR.

The exhibit of our poultry department at the fair of the Central Canada Association in this city last September, was very successful. The display was made in the farm building in conjunction with other departments. The intention to make the exhibit educational, as well as attractive, was not lost sight of, and with that object in view the following features were conspicuous, viz.:—

Incubators in operation and chickens hatching in them every day.

Brooders also in operation. In them were placed the chickens hatched by the incubators day by day. The chickens did remarkably well.

Hen sitting in nest box of pattern as used in poultry department.

Hen with brood of chickens hatched from eggs laid from 5 to 8 days after separation of male bird from hens.

Models of poultry house suitable for winter, also models of colony houses.

Groups of chickens from 2 to 4 months of age, showing correct market types.

Hens of different breeds and of exceptional good type and quality.

Chickens being fattened in crates, showing crate fattening.

Chickens being fattened, loose in pens.

Dressed poultry, showing birds as they should be sold on the market, or, in shops. Other specimens drawn and trussed ready for the oven.

New-laid eggs from different breeds. And other features of instruction and interest.

DISEASES OF POULTRY.

IMPORTANT IDENTIFICATION OF TUBERCULOSIS IN FOWLS FROM BRITISH COLUMBIA.

During the year many communications were received describing diseases and asking for remedies for the same. Numerous cases were distinguished as colds, catarrh or incipient roup and for which simple remedies were advised. In several instances the symptoms denoted serious ailment. On such occasions the letters were submitted to Dr. C. H. Higgins, Pathologist, Biological Laboratory which is situated on the Experimental Farm. Dr. Higgins expressed his willingness to examine any subjects that might be sent to him, and identify cause of ailment when possible to do so.

LOCATION OF TUBERCULOSIS IN SICK BIRDS FROM BRITISH COLUMBIA.

Early in the month of May last, a letter was received from Mr. George Lawes, of Enderby, B.C., stating that several of his fowls were in a very emaciated condition without any reason for their being so, as they had been well fed and cared for. One

or two had recently died and others seemed as if they would not last long. His letter was submitted to Dr. Higgins, who suggested that if a definite diagnosis was desired by Mr. Lawes that he be requested to send on one or more of the worst specimens. Mr. Lawes, soon after forwarded two sick fowls, and the post mortem examination of one by Dr. Higgins confirmed what from the first was suspected. A copy of his report which was made to the Veterinary Director General, Dr. J. G. Rutherford, and forwarded by that gentleman to our department, is as follows:—

'BIOLOGICAL LABORATORY,
'OTTAWA, May 30, 1904.

'No. 247. This fowl, a Buff Orpington from Geo. R. Lawes, of Enderby, B.C., was chloroformed on the 13th inst. The autopsy revealed lesions of tuberculosis, which cultures and microscopic examinations have confirmed.

'Very nearly all the tissues of the body were invaded by the lesions. The liver was about twice its normal size and contained tubercles varying in size from a pin point to a hazel nut. The spleen was about three times its normal size.

'The lesions of the intestines were of a chronic nature and were without doubt instrumental in communicating the disease to other fowls with which she associated.

(Sgd.) 'CHAS. H. HIGGINS,
'Pathologist.'

A copy of this report was mailed to Mr. Lawes with the statement that there was no known cure for tuberculosis among fowls, and that his birds were not likely to recover. Mr. Lawes afterwards wrote that his birds continued to die, one by one, and would likely do so until exterminated.

Such being the deadly nature of the disease it is of vital importance to the poultry keepers of British Columbia that its presence in their province and its fatal character should be known to them. From other points in British Columbia reports of a similar kind to that of Mr. Lawes were received. The correspondents were informed of the results of the examination, and advised to take immediate action upon conclusive identification of the disease, by killing off their birds at once. In one case a reply was received that doubtless the situation was serious, but he would risk consequences. Such a mistaken attitude is to be regretted, for it only postpones the inevitable and renders the stamping out of the disease more difficult.

Dr. D. E. Salmon, Chief of the United States Bureau of Animal Industry, in his book entitled 'The Diseases of Poultry,' writes as follows on the treatment of tuberculosis in a colony of fowls: 'The eradication of tuberculosis in birds from an infected premises can only be attempted with a fair prospect of success when all the birds are sacrificed. Any individuals that are preserved are liable to have ulcerations of the intestines, from which the bacilli are constantly distributed. There should consequently, be no attempt to save any birds from an infected flock. When the birds are all killed and disposed of by burning or deeply burying, the premises should be carefully disinfected.' Then follows detailed instructions as to the proper method of cleaning and disinfecting building and premises. Concluding, Dr. Salmon says: 'After the cleaning and disinfection is accomplished the premises should be opened to the sun and air for a monoth, if possible, before new birds are introduced.'

Writing of the tuberculous condition of the fowl from Enderby before being killed for examination, Dr. Higgins says: 'There can be no doubt that a fowl infected to such a marked degree must have been a constant menace to all others with which it may have come in contact as countless numbers of baccilli were present in the fæces. This is, I believe, *the first identification of tuberculosis in poultry in Canada.*

Other examinations made by Dr. Higgins are reported as follows:—

218. *A fowl from Experimental Farm Poultry Department.*—Autopsy reveals large tumour on left side of sternum, cystic, the cysts containing fluid dark in colour and gelatinous. Pericardial sac contains 20 cc. fluid. Heart muscle contains nodules,

abdominal cavity contains much semi-fluid gelatinous material. Spleen, liver, lungs and kidneys normal.

A microscopic examination reveals the structure of the tumour as a cystic myxo-sarcoma with metastases in the heart muscle and abdominal cavity.

219. *Buff Orpington Cock.*—Autopsy reveals ulcers in the gizzard with a congestion and thickening of the intestinal mucosa. No parasites were detected in the gizzard. Nematode worms, '*Heterakis differens*' were found in the intestines and cæca. Aside from the lesions mentioned other organs were normal.

220. *Barred Plymouth Rock (Pullet).*—Lesions similar to those noted in former case, but condition not so far advanced. Nematode worms, '*Heterakis differens*' were present in the cæca.

These two cases present an interesting condition and one not usually met with. Before stating definitely the cause, or suspected cause of the trouble, a further investigation will be necessary and other animals examined.

221. *Light Brahma (Pullet).*—This animal was infested with tape worms. '*Drepanidotaenia*'; also '*Heterakis differens*,' and the large nematode '*Heterakis inflexa*.'

To the tape worms can be ascribed the emaciated condition and general unthriftiness.

247. *Fowl sent from British Columbia.*—Dead upon arrival. Autopsy revealed an extreme impaction of the gizzard, due to six large pieces of broken crockery, the largest of which measured one and one-half centimeters by one centimeter. These were evidently swallowed to assist the digestive functions of the gizzard. No other lesions were observed microscopically.

RATIONS OF LAST WINTER.

The rations fed to the laying stock, other, than those on experiment, during last winter were:—

A. M. ration.—Wheat, sometimes buckwheat in proportion of 8 to 10 pounds to every 100 fowls. This scattered, soon after daylight, in the litter on the floors of the pens.

At 11 a.m.—Steamed lawn clippings, 3 or 4 times per week. This was eaten with evident relish. It is a very beneficial way of utilizing a form of waste. Clover leaves, treated in the same way, are equally effective.

At noon.—A few hands full of grain, if found necessary, thrown on the floor of the pens to keep hens busy.

P.M. ration.—Mash as much as could be eaten up clean 3 or 4 times per week. A liberal allowance was given, for at this time there is less likelihood of injurious effect from overfeeding than at a.m. ration.

The mash was composed of two parts shorts, one part ground oats, one part gluten meal or ground barley. Occasionally small potatoes boiled were added. Sometimes mash was fed at morning ration in lieu of grain. At such time, wheat was given at p.m. ration. Grit, mangels or turnips and water were before the fowls all the time.

Variety in the composition of the rations and in the order of feeding them were found beneficial.

Experience has shown that where there is variety in rations and care in feeding them—with requisite allowance for floor space—there is little likelihood of egg eating, or feather picking.

FLESHING CHICKENS AND FATTENING OLD HENS.

SOME OF WHICH WERE LOOSE IN PENS WITH LIMITED RUN AND OTHERS IN CRATES.

In reports of our department for the past two years will be found interesting and instructive results of the pen and crate methods of fattening chickens, which were conducted by Mr. F. T. Shutt, of the Chemical Division, and his assistants.

The experimental fleshing of chickens and fattening of old hens, during the past season, were conducted by our poultry department. Details are given in following pages.

The terms 'fleshing' and 'fattening' are used with intent, for experience has shown, that rations which are calculated to—and really do—go into 'flesh,' in the case of chickens, are frequently found in the shape of 'fat' in old hens. Experience has also shown that while flesh is desirable, fat—particularly that of old hens—is simply waste. The accumulation of fat in old hens doubtless makes increased weight and may mean a little more money to the seller, but, it is certainly loss to the purchaser, for, it is of no value to him whatever.

On the present occasion, hens of two years of age and chickens of two and three months old, were used.

The experimental fleshing of chickens in our department for several years has shown that before the best specimens can be produced the following preliminary conditions must be thoroughly understood, viz.:—

1. Chickens intended for fleshing should be of correct market types, such as can only come from the utility breeds. Hence the necessity of the parent stock being of proper breed and type.

2. Chickens should be well cared for and properly fed from time of hatching until put into pen or crate for 'finishing.'

3. The better the condition of the chickens when put into pen or crate to flesh the quicker and more complete will the 'finishing' process be.

4. Chickens which have been permitted 'to pick up their own living,' take more food, a longer period to flesh and in the end seldom make specimens that will bring the highest price.

Attention to the foregoing points will certainly bring about the best results.

In the following experiment of Pen vs. Crate, the chickens were divided into five groups and the old hens into one.

Each chicken and hen had a distinguishing number on a metal band round one of its legs.

Except where described the cross-bred chickens were of the ordinary barn-yard type.

The birds were fed twice per day and the rations were made of the consistency of thin porridge.

DETAILS OF EXPERIMENT in Fleshing Chickens in Pens and Crates. August 19, 1904.

Pen or Crate.	No. of leg band on Chicken.	Breed.	Cockerel or Pullet.	Age.		Weight.																	
				Months.	Days.	Beginning of Experiment.		1st Week.		2nd Week.		3rd Week.		4th Week.		Average at beginning of Experiment.		Average at close of Experiment.		Average total gain by chicken in 4 weeks.		Average gain by chicken in 1 week.	
						Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Group No. 1.																							
Pen	16	B. Ply. Rock	C	3	14	3	15	4	11½	5	6	5	14½	6	1								
"	25	"	C	3	14	4	5	4	14½	5	10	6	1	6	6								
"	37	"	C	3	4	3	7	3	12	4	1	4	5	4	9½	4	$1\frac{11}{12}$	5	$14\frac{5}{12}$	1	12½	0	$7\frac{1}{8}$
"	52	"	C	3	19	4	14	5	7	6	0	6	8	6	11								
"	62	"	C	3	4	3	9½	3	15½	4	10	5	1½	5	8								
"	72	"	C	3	19	4	9	4	15	5	9	5	14	6	3								
Group No. 2.																							
Crate	20	B. Ply. Rock	C	3	14	4	11	5	1	5	8	5	15	6	1								
"	21	"	C	3	4	3	5	4	0	4	3½	4	7	4	12								
"	31	"	C	3	4	3	1	3	10	4	5	4	15	5	2	3	$13\frac{1}{6}$	5	8	1	$10\frac{5}{6}$	0	$6\frac{17}{24}$
"	63	"	C	3	14	3	8	4	0½	5	0	5	9½	5	15								
"	86	"	C	3	14	4	1	4	5½	4	11½	4	15½	5	3½								
"	95	"	C	3	14	4	5	4	14½	5	2½	5	10	5	14½								
Group No. 3.																							
Pen	91	Crosses	C	3	14	3	4	3	12½	3	12½	4	11	5	0								
"	23	"	C	3	14	3	7	3	15½	3	15½	4	11	5	0								
"	29	"	P	3	0	2	5	2	12	2	15	3	3	3	3½	3	½	4	$9\frac{1}{12}$	1	$8\frac{7}{12}$	0	$6\frac{7}{48}$
"	35	"	P	3	4	2	12	3	5	3	5	4	0	4	6								
"	64	"	P	3	14	3	0	3	8	4	1	4	5	4	9								
"	66	"	C	3	14	3	7	4	0	4	10½	5	0	5	4								
Group No. 4.																							
Crate	18	Crosses	C	3	14	3	2	3	5½	3	10	3	14½	4	1½								
"	21	"	C	3	4	2	14½	3	6	3	14½	4	4	4	7½								
"	40	"	P	3	4	2	13	3	3	3	11½	3	14	3	14	3	1¾	4	$5\frac{1}{8}$	1	$3\frac{5}{12}$	0	$4\frac{41}{48}$
"	68	"	P	3	14	3	7	3	14½	4	6	4	11	4	12½								
"	87	"	P	3	14	3	1	3	3½	3	8	3	10	3	10½								
"	91	"	C	3	14	3	5	3	13	4	5½	4	14	5	1								

CHICKENS *vs.* OLD HENS IN PEN.

Pen or Crate.	No. of leg band on Chicken or Hen.	Breed.	Cockerel, Pullet or Hen.	Age. Months.	Age. Days.	Weight. Beginning of Experiment. Lbs.	Oz.	1st Week. Lbs.	Oz.	2nd Week. Lbs.	Oz.	3rd Week. Lbs.	Oz.	4th Week. Lbs.	Oz.	Average at beginning of Experiment. Lbs.	Oz.	Average at close of Experiment. Lbs.	Oz.	Average total gain by chicken in 4 weeks. Lbs.	Oz.	Average gain by chicken in 1 week. Lbs.	Oz.
Group No. 5.																							
Pen.........	19	B. P. Rock.	C	2	29	2	10	3	1	3	12	4	0	4	3								
"	20	" ..	C	2	29	2	12	3	2	3	6	4	5	4	11								
"	29	" ..	C	3	4	3	9	3	14	4	7	4	13	4	15								
"	32	" ..	C	2	29	2	13	3	7	4	2	4	8	4	12								
"	99	" ..	C	3	4	3	11	4	3	5	0	5	7	5	9								
"	50	Cross Wh. Wy. & B. L.	C	2	4	2	1	2	8	2	14	3	5	3	9	2	10	4	5	1	11	0	$6\frac{3}{4}$
"	72	" ..	C	2	4	1	14	2	5	2	15	3	5	3	8								
"	28	S. L. Wy....	C	2	16	2	8	2	14	3	7	3	13	4	2								
"	42	Buff Orp....	C	2	16	2	4	2	11	3	6	3	14	4	3								
"	87	C. W. & B. L.	C	2	16	2	6	2	12	3	5	3	11	3	14								
Group No. 6.		*Old Hens.*			years.																		
Pen.........	23	Buff Orp....	H	2		6	6	7	2	7	10	7	13	8	0								
"	27	" ...	H	2	"	5	2	6	2	6	6	6	9	6	13								
"	38	R. I. R.....	H	2	"	4	11	5	1	5	14	6	4	6	5								
"	90	"	H	2	"	5	4	5	15	6	5	6	9	6	9								
"	11	B. P. R	H	2	"	5	12	6	1	5	15	5	12	5	8								
"	17	"	H	2	"	8	4	8	10	9	2	9	10	9	12	5	$8\frac{3}{10}$	6	10	1	$1\frac{7}{10}$	0	$4\frac{17}{40}$
"	1	W. P. R....	H	2	"	5	7	5	14	6	2	6	3	6	3								
"	9	"	H	2	"	5	5	6	6	6	6	6	4	6	2								
"	58	Cross Wh. Wy. & Br. Leg.	H	1	"	5	1	5	15	6	2	6	2	6	1								
"	64	"	H	1	"	4	8	4	11	4	14	5	0	4	15								

Summary of Results, Pen vs. Crate. Weight, Development, Cost of Production, Profit from Sale of Carcases.

Group No.	Pen or Crate.	Number of Chickens.	Weight. At beginning of experiment.		Weight. At close of experiment.		Total increase in four weeks.		Cost of Production. Chickens. Initial weight.		Cost of Production. Chickens. Value at 10c. per lb.	Cost of Production. Food. Amount consumed in 4 weeks.	Cost of Production. Food. Value at $1\frac{1}{4}$c. per lb.	Cost of Production. Cost to produce one pound of increase.	Cost of Production. Total cost of production.	Returns from sale at 13c. per lb.	Profit on six chickens. Labour not counted.	—
			Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	$ cts.	Lbs.	cts.	cts.	$ cts.	$ cts.	$ cts.	
																		Rations for 1 and 2 Groups.
1	Pen.	6	24	11	35	6	10	11	24	11	2.47	39	49	$4\frac{1}{2}$	2.96	4.60	1.64	Ground oats, 2 parts; ground barley, 1 part; corn meal, 1 part; mixed with skimmed milk.
2	Crate.	6	22	15	33	0	10	1	22	15	2.29	39	49	$4\frac{4}{5}$	2.78	4.29	1.51	
																		Rations for Groups 3 and 4.
3	Pen.	6	18	3	27	6	9	3	18	3	1.82	36	45	$4\frac{9}{10}$	2.27	3.56	1.29	Ground oats, 4 parts; ground barley, 2 parts; ground corn, 1 part; meat meal, 1 part; mixed with skimmed milk.
4	Crate.	6	18	10	25	15	7	5	18	10	1.86	36	45	$6\frac{1}{10}$	2.31	3.37	1.06	
																		Rations for Groups 5 and 6.
5	Pen.	10	26	8	43	4	16	12	26	8	2.65	58	73	$4\frac{1}{3}$	3.38	5.62	2.24	Finely ground oats, 4 parts; ground peas, 1 part; ground corn, 1 part; meat meal, 1 part, mixed with skim milk.
6	"	10	55	3	66	4	11	1	55	3	5.52	54	68	$6\frac{1}{3}$	6.20	8.61	2.41	

Results of the foregoing experiments permit of the following deductions:—

The pullets with one exception did not make as great gains as cockerels of the same age.

Old hens which are well fed require no further treatment to make them fit for killing.

The older the hen the more readily does she take on fat rather than flesh.

The cross-bred chickens, although fed on a more nutritive ration, did not make as much weight as pure-bred ones.

The chickens which were loose in their pens with limited run, made slightly greater weight development, at cheaper cost, than those in crates.

STOCK ON HAND.

The following list will show the number, kind and disposition of the different varieties in our poultry houses at the present date, December, 1904:—

Pen No.	Breed.	Cock.	Hens.	Cockerels.	Pullets.	Remarks.
1	B. Ply. Rocks	1	12			
2	"	1	12			
3	Wh. "	1	8		4	
4	Buff Orpingtons	1	12			
5	Wh. Leghorns			1	12	
6	S. G. Dorkings	1	12			
7	Black Minorcas			1	11	
8	Wh. Leghorns		12	1		
9	Buff Leghorns		3	1	8	
10	Cock and cockerels	1		3		1 S. S. Hamburg cock, 1 S. S. Wyandotte cockerel, 2 Faverolles.
11	Blk. Minorcas			7		
12	Buff Leghorns			6		
13	Black Hamburgs	1		5		
14	Rock and Wyandottes			6		
15	Capons			7		
16	Black Hamburgs		4	1		
17	" "				7	
18	S. S. "		4		3	
19	Wh. Leghorns				7	
20	S. S. Wyandottes		3		3	
21	Rock and Wyandottes	1		1		1 B. Ply. Rock and 1 Wh. Wyandotte.
22	Faverolles	1	4		6	
23	Blk. Minorcas	1	5			
24	S. G. Dorkings			1	8	
25	L. Brahmas	1	3		3	
26	Crosses				10	
27	"			1	10	
28	Buff Orpingtons			1	10	
29	Wh. Wyandottes		10			
30	Crosses		12			
31	Cockerels			7		2 B. Ply. Rocks, 4 White Ply. Rocks, 1 Wh. Wyandotte.
32	Pullets (late)				12	5 B Ply. Rocks, 7 crosses.
33	Late cockerels			12		All kinds.
34	B. Ply. Rocks			1	24	
35	Wh. Wyandottes			1	24	

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

REPORT OF R. ROBERTSON, SUPERINTENDENT.

NAPPAN, N.S., November 30, 1904.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa,

SIR,—I have the honour to submit herewith my annual report of operations on the experimental farm for the maritime provinces at Nappan, N.S.

The season just passed has been the most unfavourable for farm crops of any for some years. Crops generally made a good start, but continued dry weather until the latter part of July, resulted in all farm crops being below the average. Owing to the unfavourable season, and also to the breaking of dykes in the fall of 1903, which caused the marsh to be flooded with salt water, the crop of marsh hay was very much lighter than usual. Clover sown with grain crops made a good start, but almost all died out in July due to lack of moisture. Roots also suffered greatly for want of rain. The red-backed cutworm did considerable damage, especially to the mangel crop, and many fields in the maritime provinces were practically destroyed by this pest. Pastures were exceptionally poor except in the very early part of the season.

I wish to again acknowledge my indebtedness for valuable assistance rendered by Mr. J. Thomas Coates, farm foreman, who has kept all records of crop experiments, and to Mr. R. Donaldson, herdsman, who has kept all records of live stock experiments, each doing so in a careful and painstaking manner.

WEATHER.

The temperature during December was higher than usual, but the snowfall was greater than that for a number of years past. There was quite a fall of snow on the 1st, which, with that on the following day, amounted to about six inches, and made very good sleighing. There was rain and snow on the 3rd, and about twelve inches of snow on the 4th. This made the roads heavy for travel, but soon they were in good condition. The weather continued fine, with occasional snowfalls until the 13th, excepting the 10th, when wind and rain took off some of the snow. The 13th was mild, with rain, which took off much of the snow, making sleighing poor. On the 17th the thermometer went to zero, and on the 18th 4° below zero was registered. The weather kept cold to the 21st, when a thaw with rain took the snow all off. The 22nd was also mild, after which cooler weather continued to the 27th, when the thermometer went to 4° below zero, and 5° below on the 29th, and 2° below on the 30th. It snowed again on the 30th, making good sleighing.

January commenced with very bright cold weather on the 1st and 2nd, when the thermometer registered 10° and 14° below zero on these dates respectively. There was a heavy snow and wind storm on the 3rd and on the 4th, roads had to be broken out in many places. This was followed by light cold weather to the 10th, except a light snowfall on the 8th and 9th. The thermometer registered 11°, 14°, 12°, 2° and 5° below zero on the 3rd, 4th, 5th, 6th and 8th, respectively. From the 10th to the 17th was quite moderate, with occasional falls of snow, and a light rain on the 14th. On the 17th a snow and wind storm blocked the roads again. The weather was fine from this date to the 23rd, when it thawed and some rain fell. The thermometer registered 0°, 15°, 17° and 12° below zero on the 18th, 19th, 20th and 22nd ,respectively. There was a sleet storm on the 25th, followed by quite fine cold weather which con-

tinued to the end of the month. The thermometer registered zero on the 26th and 28th, and 3° and 8° below zero on the 29th and 31st, respectively.

February commenced with rain. The thermometer, however, fell below zero the following day, and on the 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th and 10th registered 3°, 3°, 6°, 5°, 29°, 2°, 0°, 3° and 8° below zero respectively. This period was more or less windy with occasional snowfalls. From the 10th to the 14th was fine, with snow on the 15th, which drifted badly on the 16th and 17th. The thermometer registered 10°, 8° and 10° below zero on the 13th, 14th and 15th respectively. On the 19th and 21st the thermometer registered 6° and 15° below zero. There was a rain on the 22nd. The balance of the month was more or less broken by wind and snow storms, and very cold on the 27th and 28th, when the thermometer went to 19° and 16° below zero respectively. The month throughout was much colder than usual.

The thermometer went below zero only three times in March, on the 5th, 6th and 18th, when it registered 1°, 4° and 1° below zero respectively. The first of the month was quite cold, with a thaw on the 3rd, and a wind, rain and lightning on March 4th, which made quite a freshet. It froze up again and remained cold to the 7th, when it moderated, followed by a thaw and rain on the 8th and mild on the 9th. From this time to the 16th the weather was fine and quite cold. From the 16th to the 27th was more or less broken with snow and rain storms, with a thaw on the 26th which took off about all the snow and broke up sleighing. The remainder of the month was fine.

April commenced cold but fine, followed by fine moderate weather to the 9th. Rain fell on the 9th, 10th and 12th. The 14th and 15th were cold and windy, and on the 16th there was quite a fall of snow. The 17th and 18th were fine but cold, and on the 19th nearly an inch of rain fell. This was followed by an unusually heavy snow storm, accompanied by wind which made the snow drift badly. The remainder of April was fine, with warm drying winds, except the last two days, when rain fell. The rainfall for the month was 2·92 inches.

May was fine to the 17th, with the exception of the 10th, when a light rain occurred. On the 17th and 19th 1·23 inches of rain fell. The first seeding was done May 4, and continued to the 17th. From the 19th to the end of the month several small showers are recorded, but seeding continued practically uninterrupted. The month throughout was warmer than usual. Frost is recorded only four times during the month. On the 1st, 2nd, 6th and 7th there was 1°, 5°, 6° and 5° of frost respectively. Vegetation made very rapid growth and the season which appeared backward when May opened was at the close of the month as far advanced as usual. The total rainfall for the month was 1·76 inches.

The month of June was exceptionally dry and fine throughout. The rainfall on the 5th of about ¾ of an inch, and on the 22nd of nearly ½-inch were the only rains of any consequence during the month. The total rainfall for the month was 1·74 inches. The thermometer registered frost on the 9th, and 2° of frost on the 10th, which did considerable damage. The thermometer went to 80° and above three times, on the 21st, 26th and 27th, when 80°, 80° and 82° was registered, respectively. The month throughout was considerably warmer than last year. Crops suffered towards the last of the month for want of rain, and seed of late sown roots did not germinate well.

The month of July was unusually warm, and while 2·15 inches of rain fell; yet, warm drying winds following the showers, none of which were sufficient to more than wet the surface of the ground, quickly dried up the ground again and crops suffered greatly. The thermometer registered above 80° twelve times during the month. The highest temperature was on the 13th, 18th and 29th, when 83° was registered.

The month of August, while warmer somewhat than the previous year, was not as warm as usual. The thermometer only once went to 80°, and that was on the 4th. There was a light rainfall on the 1st, but the early part of the month was entirely too dry for growth, and grain crops especially ripened up prematurely. After the 11th the month was more or less broken, and the rainfall of 1·70 inches on the 21st was the

first one during the season to wet the ground sufficiently for root crops to grow properly. The rainfall during the month was 3·51 inches. There was a heavy wind storm the 23rd, which did considerable damage to crops, especially corn and apples.

There was a heavy rainfall on September 3, 4 and 6, totalling 1·90 inches; also on the 25th of 1·20 inches, and other showers with these brought the month's fall of rain to 4·52 inches. The month, generally speaking, was fine and a good one for getting along with work. The temperature on the average was not as high as last season, and much lower than for the past three years. The highest temperature for the month was recorded on the 15th and 17th, of 77°. There was a heavy wind storm with some rain on the 15th. This was accompanied by very high tides, one of which was increased by the high wind prevailing, and did great damage by running over and breaking a great amount of dyke and flooding marsh lands in this section. The thermometer went to freezing on the 9th, 20th, 22nd and 29th, and there was 1° of frost on the 1st, 9° on the 23rd, and 2° on the 28th.

During the month of October there was one quite heavy rainfall on the 13th of ·97 inches, and a very heavy one on the 22nd of 2·98 inches. Outside of these the month was quite fine, with occasional showers, making the total rain for the month 5 inches. There was more or less frost during the month, and the thermometer went below freezing during 14 nights. The lowest temperature, however, was on the 8th, when 9° of frost was registered.

November commenced with a slight fall of snow, followed by cold weather until the 4th, when there was quite a heavy fall of rain, and a shower on the 6th. The following week was fine but cold, the ground not thawing sufficiently to harvest roots and plough. The 14th commenced wet, followed by snow and wind, and the temperature below freezing. The 16th was milder, followed by colder weather; some snow on the 17th, and rain on the 18th. The weather continued quite fine and moderate until the 26th, with quite a rainfall on the 24th. The 28th and 29th were cold, followed by rain and a thaw on the 30th.

RAINFALL.

April	2·92	inches.
May	1·76	"
June	1·74	"
July	2·15	"
August	3·51	"
September	4·52	"
October	5·00	"
November	3·39	"
Total	24·99	"

METEOROLOGICAL RECORD.

The maximum and minimum thermometrical observations for the year beginning December 1, 1903, and ending November 30, 1904 :—

Month.	Maximum.	Minimum.
1903.		
December	10th 47° above zero	29th 5° below zero.
1904.		
January	14th 42° above zero	20th 17° below zero.
February	22nd 43° "	6th 29° "
March	26th 53° "	6th 4° "
April	30th 66° "	4th 9° above zero.
May	9th 75° "	6th 26° "
June	27th 82° "	10th 30° "
July	13th, 18th and 29th, 83° above zero.	9th 45° "
August	4th 80° above zero	30th 35° "
September	15th and 17th 77° above zero	23rd 23° "
October	21st 78° above zero	8th 23° "
November	24th 49° above zero	29th 12° "

EXPERIMENTS WITH OATS.

Experiments were again continued this year with the leading sorts of oats which were grown in uniform test plots of one-fortieth acre each. Forty-two varieties were included in this test. The plots all received the same treatment and were on soil practically uniform throughout.

The ground was a sandy loam, and was previously in mangels, having been manured for that crop with 30 one-horse cart loads of stable manure per acre. The land was ploughed in the fall after the mangel crop was harvested, and this spring was harrowed twice with the springtooth, and once with the smoothing harrow. The seed was sown May 13, at the rate of 2½ bushels of seed per acre with the seed drill. The ground was also seeded down to clover and Timothy at the rate of 3 pounds Alsike clover, 7 pounds Mammoth Red clover and 12 pounds of Timothy seed per acre by means of a grass seed attachment to the grain drill. The grain used was from heads selected in the field at harvest time before cutting the various plots the previous season, except the variety, Storm King, a new variety originated by Garton Bros., England, seed of which was sent from the Experimental Farm, Ottawa.

No fertilizer was used on these plots this season. The grain started well and made fair growth to the middle of July, when the effect of the continued dry weather was quite apparent. The grain ripened up prematurely, giving a light crop of only fairly well filled oats. The straw was short but stiff, and only a few heads of smut were noticeable. Some slight rust made its appearance early in August. The following yields were obtained from these plots.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Manuring.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	
1	Swedish Select........	Aug. 19	98	36—40	Stiff......	6—8	Branching..	4,280	72	32	38
2	Siberian	" 22	101	38—42	"	6—8	" ..	3,600	69	14	35
3	Golden Fleece	" 20	99	33—38	"	5—8	" ..	4,160	68	8	35
4	Columbus............	" 19	98	35—40	Medium..	6—7	" ..	2,800	65	30	36
5	Banner..............	" 19	98	37—40	Stiff......	6—8	" ..	3,600	64	4	35½
6	Golden Beauty........	" 19	98	38—42	"	6—8	" ..	3,880	63	18	35
7	Golden Tartarian......	" 27	106	33—37	"	6—9	Sided.......	3,520	63	18	34
8	Irish Victor	" 18	97	38—42	"	6—8	Branching..	3,200	62	12	36
9	Holstein Prolific......	" 20	99	37—41	"	6—8	" ..	3,480	61	26	36
10	Wide Awake..........	" 19	98	38—41	"	6—8	" ..	3,200	61	6	37½
11	Lincoln..............	" 22	101	33—38	"	6—8	" ..	3,120	61	6	36½
12	Goldfinder............	" 24	103	34—38	"	6—8	" ..	3,160	61	6	35
13	Waverley............	" 18	97	40—46	"	6—9	" ..	3,320	60	20	36
14	Golden Giant.........	" 27	106	33—38	"	6—9	Sided.......	3,880	60	20	33
15	Sensation............	" 18	97	38—43	"	6—9	Branching..	3,240	60	..	37½
16	White Giant..........	" 20	99	32—38	"	5—8	" ..	3,840	60	..	34
17	Improved American...	" 22	101	34—39	"	5—8	" ..	3,920	60	..	34
18	Twentieth Century....	" 18	97	36—40	Medium..	7—8	" ..	3,040	59	14	37
19	Pioneer..............	" 17	96	35—40	Stiff......	6—8	" ..	3,880	58	28	38
20	Abundance...........	" 20	99	33—38	"	5—8	" ..	3,840	58	28	35½
21	Thousand Dollar......	" 20	99	34—38	"	5—8	" ..	3,520	57	2	37
22	Joanette.............	" 17	96	32—36	"	5—7	" ..	3,200	56	16	36
23	American Beauty.....	" 19	98	39—43	"	6—8	" ..	3,320	56	16	35
24	Danish Island	" 24	103	34—40	"	5—8	" ..	3,880	56	16	34
25	Improved Ligowo.....	" 18	97	34—40	"	6—8	" ..	3,600	56	16	37
26	Milford Black	" 20	99	33—38	"	6—8	Sided.......	3,720	55	10	38
27	Early Golden Prolific..	" 19	98	38—42	Medium..	6—8	Branching..	3,400	55	10	35
28	Bavarian.............	" 20	99	32—38	Stiff......	6—8	" ..	3,840	55	10	35
29	Kendal White	" 20	99	32—36	"	5—8	Sided.......	3,080	55	10	36
30	Scotch Potato.........	" 22	101	38—42	"	6—9	Branching..	3,680	54	4	36½
31	Kendal Black........	" 20	99	35—40	"	6—8	Sided.......	3,480	52	32	38
32	Black Beauty.........	" 17	96	36—41	Medium..	7—9	Branching..	3,000	51	26	36
33	Tartar King..........	" 18	97	37—40	Stiff......	6—8	Sided.......	3,160	50	20	39
34	Storm King..........	" 19	98	32—38	"	6—8	"	3,520	50	20	38
35	Pense Black	" 20	99	33—38	"	5—8	"	3,080	49	14	38
36	Buckbee's Illinois.....	" 23	102	35—40	"	6—9	Branching..	3,240	49	14	36
37	Olive Black	" 20	99	32—38	"	6—8	Sided.......	3,280	48	8	38
38	Pense White..........	" 20	99	33—38	"	6—8	"	3,120	48	8	38
39	Milford White........	" 20	99	32—37	"	5—8	"	2,680	45	30	38
40	Mennonite............	" 24	103	34—38	"	6—8	Branching..	3,080	45	30	36
41	Olive White	" 20	99	33—38	"	6—8	Sided.......	2,920	44	24	38
42	American Triumph....	" 27	106	34—39	"	6—9	Branching..	3,440	44	24	36

EXPERIMENTS WITH BARLEY.

Twenty varieties of six-rowed and fifteen varieties of two-rowed were sown May 24 in plots of one-fortieth acre each. The land was a sandy loam and was in corn the previous season, for which crop 25 one-horse cart loads of stable manure per acre was used. The ground was ploughed after the corn crop was removed, and this spring was worked up twice with the springtooth harrow and once with the smoothing harrow. The seed sown was from heads selected in the field at harvest time before the plots were cut the previous season.

The grain was sown with the seed drill at the rate of 2 bushels per acre, and 3 lbs. alsike clover, 7 lbs. Mammoth Red Clover and 12 lbs. Timothy seed was sown at the same time. No fertilizer was used this season. The seed germinated well but owing to the drought the straw was short and the yield per acre not up to the average. There was no rust, and very few heads of smut. The following table gives further information respecting this test :—

BARLEY, SIX-ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Trooper	Aug. 16..	84	35—40	Stiff	2 —3	4,720	50	..	48
2	Mensury	" 18..	86	35—40	"	2½—3¼	4,600	49	8	46
3	Royal	23..	91	35—40	Medium..	2 —2½	4,440	49	8	48
4	Yale	" 24..	92	35—40	Stiff	2 —3	3,880	47	..	47½
5	Oderbruch	" 16..	84	34—38	Medium..	2 —3	4,120	45	40	46½
6	Stella	" 25..	93	34—37	Stiff	2 —2½	4,400	45	40	48
7	Rennie's Improved	16..	84	32—36	"	2 —2½	4,040	45	..	47
8	Empire	" 20..	88	35—40	"	2 —3	4,000	45	..	47
9	Summit	" 25..	93	34—37	"	2 —2½	3,480	44	8	48
10	Brome	" 20..	88	30—33	"	1½—2½	3,360	44	8	46
11	Common	" 16..	84	34—37	Medium..	2 —3	3,560	43	16	47
12	Odessa	" 16..	84	34—38	"	2 —3	3,720	43	16	46½
13	Garfield	" 20..	88	35—40	Stiff	2 —3	3,800	42	24	46
14	Nugent	" 22..	90	33—36	"	2 —3	3,840	41	32	47
15	Claude	" 16..	84	32—36	Medium..	2 —2½	3,600	41	32	46½
16	Albert	" 16..	84	33—36	"	2 —3	3,320	40	..	48
17	Baxter	" 16..	84	31—35	"	2 —2½	3,040	39	8	46
18	Champion	" 15..	83	36—42	"	2½—3½	4,200	38	16	40
19	Mansfield	" 23..	91	33—38	Stiff	2½—3¼	3,240	37	24	46
20	Argyle	" 19..	87	33—36	"	2 —3	3,160	35	40	47

BARLEY, TWO-ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Danish Chevalier	Aug. 22..	90	32—36	Medium..	3 —4	5,000	57	24	50
2	French Chevalier	" 22..	90	30—35	"	3 —4	3,880	45	40	49½
3	Dunham	" 22..	90	35—40	"	3 —4	4,800	44	8	50
4	Beaver	" 20..	88	32—35	"	2½—3½	3,800	42	24	50
5	Logan	" 24..	92	35—40	"	3 —4	4,800	41	32	50
6	Harvey	" 24..	92	32—36	"	2 —3	3,600	36	32	49
7	Clifford	" 22..	90	36—40	"	2½—3½	3,640	35	..	50
8	Sidney	" 22..	90	30—35	"	3 —3½	2,880	32	24	49
9	Fulton	" 24..	92	34—38	"	2 —3	3,680	32	4	50
10	Invincible	" 24..	92	30—35	"	2½—3¼	3,440	31	24	48
11	Standwell	" 24..	92	28—33	"	2 —3	2,880	27	24	47
12	Newton	" 24..	92	30—34	"	2¼—3	2,640	26	32	47
13	Canadian Thorpe	" 24..	92	34—36	Stiff	2 —3	2,400	22	24	49
14	Jarvis	" 20..	88	30—36	Medium..	2½—3¼	2,520	21	32	48
15	Gordon	" 22..	90	32—36	Stiff	2 —3	1,800	21	32	48

EXPERIMENTS WITH SPRING WHEAT.

The ground selected for the wheat plots was similar to that on which the oats were grown, and received the same treatment. The seed sown was from heads selected in the field at harvest time before cutting the various plots the previous season. The seed was sown May 12, at the rate of 1¾ bushels per acre with the grain drill, and 3 lbs. Alsike clover, 7 lbs. Mammoth Red clover, and 12 lbs. Timothy seed per acre was sown at the same time.

The plots were one-fortieth of an acre each and thirty-six varieties were included in the test. The seed started well, but owing to the effect of the continued drought the crop was light, and rust early in August did considerable damage to the straw and the grain did not fill out well. The yield per acre and other information obtained from these plots is given in the following table :—

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Byron	Aug. 20	100	40—44	Stiff	2 —3	Bearded	4,600	28	40	60	Slightly.
2	Red Fife	" 24	104	42—47	"	2 —3	Beardless	4,800	28	..	59	"
3	White Fife	" 24	104	44—48	"	2 —3½	"	4,400	27	20	59	"
4	Rio Grande	" 22	102	43—48	"	2½—4	Bearded	4,480	27	..	60	"
5	Admiral	" 22	102	44—48	"	2 —3	Beardless	3,600	26	40	58½	Badly.
6	Preston	" 20	100	42—44	"	2 —3	Bearded	3,400	26	..	59	Slightly.
7	Australian No. 9	" 22	102	40—45	"	2 —3	Beardless	3,040	26	..	59	Badly.
8	White Russian	" 24	104	44—47	"	2½—3½	"	3,920	26	..	60	Slightly.
9	Benton	" 22	102	42—46	"	2½—3½	"	3,720	25	20	59	"
10	Wellman's Fife	" 24	104	43—48	"	2½—3¾	"	4,640	25	20	58½	Badly.
11	Dawn	" 22	102	32—36	"	2 —3	"	2,840	24	40	59	Slightly.
12	Colorado	" 20	100	42—48	"	2 —3	Bearded	3,080	24	40	60½	Medium.
13	Plumper	" 20	100	36—40	"	2 —3	"	3,840	24	20	60½	Slightly.
14	Early Riga	" 18	98	38—43	"	2 —2½	Beardless	2,880	24	20	59	"
15	Monarch	" 25	105	40—46	"	2¼—3½	"	2,880	24	20	59½	"
16	Crawford	" 23	103	42—46	"	2 —3	"	2,960	24	..	58½	Badly.
17	Huron	" 22	102	42—45	"	2 —3	Bearded	3,480	24	..	60	Slightly.
18	Hastings	" 22	102	36—42	Medium	2 —3	Beardless	2,920	24	..	60½	"
19	Countess	" 22	102	40—44	Stiff	2 —3	"	2,880	23	20	58	"
20	Herisson Bearded	" 22	102	40—44	Medium	1½—2	Bearded	3,920	23	20	60	"
21	Chester	" 22	102	40—43	Stiff	2 —3	Beardless	3,520	23	..	59	"
22	Power's Fife (Minn. 149)	" 22	102	40—45	"	2 —3	"	2,880	22	40	59½	"
23	Red Fern	" 22	102	42—46	"	2½—3½	Bearded	2,960	22	40	59	"
24	Laurel	" 25	105	45—48	"	3 —4	Beardless	3,880	22	20	59	"
25	Pringle's Champlain	" 20	100	45—48	"	2½—3½	Bearded	3,120	22	..	60	"
26	Advance	" 22	102	40—44	"	2 —3	"	2,520	21	40	59	Badly.
27	Hayne's Blue Stem (Minn. 169)	" 24	104	40—44	"	2½—4	Beardless	2,640	21	40	59	Slightly.
28	Clyde	" 22	102	38—42	"	2½—4	"	2,760	21	20	58	"
29	Hungarian	" 22	102	40—42	Medium	2 —3	Bearded	3,200	21	20	60	"
30	Australian No. 19	" 22	102	36—40	Stiff	2 —3	Beardless	2,440	21	..	59	Badly.
31	Weldon	" 22	102	40—45	"	2 —3½	"	2,280	20	40	59	Slightly.
32	Stanley	" 24	104	42—46	"	2 —3¼	"	4,240	20	20	59½	"
33	Fraser	" 20	100	34—40	Medium	2 —2½	Bearded	2,680	20	..	59	"
34	Minnesota No. 163	" 24	104	39—43	Stiff	2 —3½	Beardless	2,480	20	..	59	"
35	McKendry's Fife (Minn. 181)	" 24	104	40—45	"	2 —3¼	"	3,440	20	..	59	"
36	Percy	" 23	103	43—47	"	2 —3¼	"	4,080	18	40	58	Badly.

EXPERIMENTS WITH MACARONI WHEAT.

Four varieties of Macaroni wheat were sown. These were grown in plots of one-fortieth acre each, alongside the other wheat plots. The ground was similar and received similar treatment to the wheat plots and was sown at the same time, but the crops of grain harvested were light. A well-known variety of Macaroni wheat is that called 'Goose.' The reason for putting these wheats in a separate table is on account of their inferior milling qualities, as their growth for bread-making would prove unsatisfactory. The following table gives the yield per acre and other information respecting these plots:—

MACARONI WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs	
1	Goose	Aug 22	102	33—38	Medium	2 —2½	Bearded	2,280	16	..	61	Slightly.
2	Yellow Gharnovka	" 24	104	36—40	"	2 —2½	"	2,520	14	..	61	Very slightly.
3	Roumanian	" 24	104	36—40	"	2 —2½	"	......	13	20	62	Slightly.
4	Mahmoudi	" 24	104	30—36	Weak	1½—2½	"	......	8	..	60	Very slightly.

EXPERIMENTS WITH EMMER AND SPELT.

Two varieties of Emmer and two varieties of Spelt were sown in plots of one-fortieth acre each May 12. The land was similar to and received the same treatment as that on which the other wheats were grown. These varieties are separated from the bread wheats for the reason that they are useful principally for grinding for stock feed, and from the fact that in ordinary threshing the chaff is not separated from the kernels. The yield of these plots is given in pounds for the reason that this grain in the chaff cannot fairly be compared with other sorts of wheat which are threshed clean.

EMMER AND SPELT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.	Weight per Bushel.	Proportion Rusted.
				In.		In.		Lbs.	Lbs.	Lbs	
1	Red Spelt	Aug. 30	110	36—42	Stiff	2 —3¼	Beardless	3,120	1,400	30	Badly.
2	White Spelt	" 30	110	37—43	"	3½—5	"	......	1,120	33	"
3	Common Emmer	" 22	102	28—33	Weak	1½—2	Bearded	2,280	1,040	40	Slightly.
4	Red Emmer	" 30	110	35—40	Stiff	2½—3	"	2,200	1,000	35	"

EXPERIMENTS WITH FIELD PEASE.

The land on which the pease were sown was a clay loam, and was previously in clover and timothy. The land was not in a fertile condition. The only fertilizing it ever received was a crop of green pease ploughed under in 1901, and an application of marsh mud in 1902. The sod was ploughed in the fall and this spring was worked up once each with the disc, spade, and springtooth harrows. No fertilizer was used. The seed was sown with the seed drill at the rate of from 2 to 3 bushels per acre according to the size of the pea. Mammoth Red clover at the rate of 10 lbs. per acre was also sown. The plots were one-fortieth acre each. Thirty-one varieties were sown May 28. The growth of vine was short, and the yield per acre small. The following particulars were obtained from these plots:—

PEASE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
					In.	In.		Bush.	Lbs.	Lbs.
1	Prince Albert	Sept. 5..	100	Strong....	35—40	1½—2	Small...	36	40	60
2	Carleton	" 5..	100	Medium..	32—36	2—2¼	Medium	36	..	60
3	Agnes	" 5..	100	Strong....	38—42	2—3	Large ..	34	..	61
4	Archer	" 5..	100	"	36—40	2—2½	Medium	33	20	60½
5	Nelson	Aug. 30..	94	Medium..	30—34	2—2¼	"	33	20	61
6	King	" 30..	94	" ..	35—40	2—2½	"	32	..	61
7	Macoun	Sept. 5..	100	Strong....	35—40	2—3	Large ..	31	20	60
8	Golden Vine	Aug. 30.	94	Medium..	32—36	1½—2	Small...	31	20	61
9	Pride	Sept. 2..	97	" ..	30—36	2—2¼	Medium	30	40	61
10	Victoria	" 7..	102	Strong....	35—40	2—3	Large...	30	40	58
11	Prince	" 5..	100	"	33—41	2—2½	Medium	29	..	60
12	Gregory	" 5..	100	"	36—40	2—2½	Large ..	28	40	60
13	Large White Marrowfat	" 2..	97	"	36—42	2—3	" ..	28	..	61
14	Mackay	" 5..	100	"	33—38	2—2½	" ..	28	..	60
15	Crown	Aug. 30..	94	Medium..	30—34	1½—2	Small...	27	20	63
16	Chancellor	" 30..	94	" ..	24—28	1½—2	" ..	26	40	60
17	Duke	Sept. 2..	97	" ..	28—33	2—2¼	Medium	26	..	61
18	German White	Aug. 30..	94	" ..	26—30	1½—2	Small...	26	..	62
19	Black eyed Marrowfat	Sept. 5..	100	" ..	35—40	2—3	Large ..	25	20	61
20	Picton	" 5..	100	" ..	30—40	2—2¼	Medium	25	..	61
21	Pearl	" 5..	100	" ..	30—36	2—2¼	"	24	40	59
22	Arthur	Aug. 30..	94	" ..	30—33	2—2½	"	24	..	62
23	Wisconsin Blue	" 31..	95	" ..	30—33	1½—2¼	"	24	..	62
24	Daniel O'Rourke	" 29..	93	" ..	32—36	1½—2	Small...	23	20	62
25	Mummy	" 31..	95	" ..	30—33	2—2¼	Medium	22	40	62
26	Kent	Sept. 5..	100	" ..	35—40	2—2½	Large...	22	40	60½
27	English Grey	Aug. 30..	94	" ..	24—30	2—2¼	Medium	21	20	61
28	Early Britain	" 30..	94	" ..	28—32	1½—2	"	20	40	61
29	Paragon	" 29..	93	Poor	24—30	1½—2	"	20	..	62
30	Prussian Blue	" 30..	94	Medium..	28—33	2—2¼	Small...	19	20	61
31	White Wonder	" 29..	93	Poor	24—26	2—2½	Medium	12	40	62

EXPERIMENTS WITH BUCKWHEAT.

Five varieties of buckwheat were sown June 11, with the seed drill. The plots were one-fortieth of an acre each. They were cut September 5. The soil was a clay loam and had clover and timothy as a previous crop. The land was not in a fertile condition. The only fertilizing it ever received was a crop of green pease ploughed under in 1901, and an application of marsh mud in 1902. The sod was ploughed in the fall and worked up this spring by going over it twice with the springtooth, and once each with the spade and smoothing harness. The following yields per acre were obtained:—

BUCKWHEAT—TEST OF VARIETIES.

Name of Variety.	Yield per Acre.		Weight per Bushel.
	Bush.	Lbs.	Lbs.
Siberian or Tartarian	29	8	49
Silverhull	22	24	50
Grey	21	32	49
Rye	21	32	52
Japanese	15	..	48

FIELD CROPS OF GRAIN.

Four acres of grain were sown in acre plots, May 30. The land was a light clay loam and was previously in corn, having been manured for that crop with 30 one-horse cart loads of stable manure per acre. The ground was ploughed this spring and worked up with the springtooth and smoothing harrows. The seed was sown with the seed drill. One acre was in barley, sown at the rate of two bushels of seed per acre; one acre White oats and one of Black oats sown at the rate of three bushels per acre, and one acre of mixed grain, made up of two bushels Sensation oats, one bushel of Odessa barley and one peck Golden Vine pease, sown at the rate of three bushels per acre. The land was also seeded down to clover and Timothy. The following table gives the yield per acre, and varieties used:—

Name of Variety.	When Cut.	Weight per Bushel.	Yield per Acre.	
		Lbs.	Bush.	Lbs.
1 acre Odessa barley	Aug. 22	48	27	26
1 " Sensation oats	Sept. 3	37	56	25
1 " Black Tartarian oats	" 7	34	40	27
1 " mixed grain	Aug. 30	42	47	13

FIELD CROP OF MIXED GRAIN—FERTILIZER EXPERIMENTS.

Six half-acre plots were sown with mixed grain. The land was in a poor state of fertility. It was previously in clover and Timothy, which sod was ploughed last fall. The seed was sown May 30, and was made up of Sensation oats, two bushels; Odessa barley, one bushel; and Golden Vine pease, one peck; mixed together and sown at the rate of three bushels seed per acre.

The ground was worked up with the spade, springtooth, and smoothing harrows, and the seed sown with the seed drill. Fertilizers were sown on four of these plots by means of a fertilizer attachment to the seeder, and two were left without fertilizers. The crop was cut August 5, and the following yield per acre obtained:—

FIELD CROP OF MIXED GRAIN—FERTILIZER EXPERIMENTS.

Size of Plot and Fertilizer Used.	Yield per Acre.	
	Bush.	Lbs.
½ acre; no fertilizer used	26	..
½ acre; Pidgeon's Fine Ground Bonemeal, 250 lbs. per acre	35	..
½ acre; 'Imperial' brand fertilizer, 250 lbs. per acre	33	..
½ acre; no fertilizer used	28	..
½ acre; Pidgeon's Fine Ground Bonemeal, 250 lbs. per acre	34	..
½ acre; 'Imperial' brand fertilizer, 250 lbs. per acre	34	20

FIELD CROP OF MIXED GRAIN.

One field of six acres was seeded to mixed grain, May 14. Three pounds of Alsike, 7 pounds of Mammoth Red clover and 12 pounds of Timothy seed per acre were also sown at the same time. The land is a clay loam, and was previously in clover, being in grain in 1902, and in roots in 1901, for which crop, stable manure at the rate of 25 one-horse cart loads per acre was used. The ground was in a fair state of fertility. The crop was cut August 17, and the field yielded at the rate of 45 bushels per acre, weighing 42 pounds per bushel. The field was seeded at the rate of three bushels per acre with seed made up as follows:—Snsation oats, 2 bushels; Odessa barley, 1 bushel; Golden Vine pease, 1 peck mixed together.

FIELD CROP OF OATS ON MARSH LANDS.

Three acres of oats were sown May 16 on marsh land that had been ploughed the previous fall. This was seeded broadcast by hand and Timothy and clover seed was also sown. The dry summer was particularly disastrous to marsh grain crops. The ground became hard and dry and very little growth was made after the early part of July. On account of the dykes breaking in the fall of 1903 this land was flooded by tide water, which may also have had a tendency to decrease the yield. The grain was cut August 22, and gave a total yield of 80 bushels or an average yield of 26 bushels, 21 pounds per acre.

FIELD CROP OF BUCKWHEAT.

Five acres of buckwheat was sown on land three acres of which had been in rape last year, and two acres in sand vetch. These two crops made light growth, and were pastured to sheep. This ground is practically new land in a poor state of fertility, and has been used as a sheep pasture for years. It was ploughed this spring and was worked up with the springtooth and smoothing harrows and seeded to buckwheat at the rate of 1¼ bushels per acre, on June 16. The crop was harvested September 7. The yield from this field was 64 bushels, or averaging hardly 13 bushels per acre.

EXPERIMENTS WITH INDIAN CORN.

The soil chosen for the corn plots is a light clay loam. The previous crop was turnips, for which crop 35 one-horse cart loads of stable manure per acre was applied. The ground was not ploughed last fall. It was worked up this spring first with the spade harrow and then manured at the rate of 15 one-horse cart loads of stable manure per acre, which was ploughed under and again worked up with the spade harrow, followed by the springtooth and smoothing harrows. Complete fertilizer at the rate of 400 pounds per acre was sown along the rows and hills when the seed was planted.

The seed was planted in hills and rows June 1. One set of plots was in hills 3 feet apart each way, and from 4 to 6 plants were left in a hill, and the other was in rows 3 feet apart and the plants were thinned to about 6 inches apart. There were twenty varieties included in this test. The crop was harvested and weighed September 28. The yield per acre is calculated from the weight obtained from two rows each 66 feet long. The wind storm of August 23 and frost September 1 did some damage to those plots, after which they made little growth.

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	Height.	When Tasselled.	In Silk.	Condition when cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
		Inches				Tons.	Lbs.	Tons.	Lbs.
1	Thoroughbred White Flint....	85	Sept. 20..	....	Tasselling ...	20	1,030	17	870
2	Salzer's All Gold............	94	Aug. 31..	Sept. 9..	Silked........	20	700	15	250
3	Red Cob Ensilage...........	98	" 31..	" 20..	"	17	870	17	650
4	Pride of the North	102	" 31..	" 20..	"	17	320	14	270
5	Superior Fodder.............	84	Sept. 9..	....	Tasselling	17	100	15	30
6	King Philip......	90	Aug. 15..	Aug. 25..	Soft glazed ...	15	1,900	15	1,350
7	Longfellow	84	" 10..	" 20..	Glazed	15	1,680	14	1,150
8	Eureka	95	" 31..	....	Silked........	15	1,350	14	1,700
9	Giant Prolific Ensilage.......	97	Sept. 5..	....	"	15	800	13	1,830
10	Evergreen Sugar	86	Aug. 15..	Aug. 25..	Watery	15	800	12	200
11	Angel of Midnight	86	" 10..	" 20..	Glazed	14	1,480	15	140
12	White Cap Yellow Dent......	100	" 23..	" 31..	Watery	14	930	12	970
13	Early Butler...	78	" 30..	....	Silked........	14	490	10	1,230
14	Compton's Early.............	80	" 10..	Aug. 20..	Glazed	13	1,500	11	770
15	Early Mastodon.	82	" 27..	Sept. 5..	Silked........	13	950	12	750
16	Cloud's Yellow Dent	96	" 25..	" 20..	"	12	1,850	11	1,100
17	Champion White Pearl.......	96	" 27..	" 3..	Watery	12	750	10	1,120
18	North Dakota	72	" 13..	Aug. 27..	Soft glazed ...	11	1,650	10	350
19	Mammoth Cuban	80	" 27..	Sept. 5..	Silked........	11	1,430	11	1,850
20	Selected Leaming..	88	" 25..	" 15..	"	10	350	8	1,270

FIELD CROP OF CORN—FERTILIZER EXPERIMENTS.

Three acres of corn was planted in rows 3 feet apart, June 10, on a soil of a light clay loam character. One-third running across one end of the field was in clover the previous year; in grain in 1902, and roots in 1901, for which crop 30 one-horse cart loads of stable manure was used per acre. One-third running across the centre of the field was in grain last year, having been manured in 1902 for roots at the rate of 35 one-horse cart loads per acre, and one-third running across the other end of the field was in roots last year, having been manured for that crop with 35 one-horse cart loads of stable manure per acre. The rows ran lengthwise of the field across each of these three differently treated pieces of the field. The two former, clover and grain stubble, were ploughed the fall previous, and the third, on which roots were grown, was not ploughed in the fall. This spring the whole field was worked up by going over it once each with the disc and spade harrows, after which stable manure at the rate of 20 tons per acre was scattered broadcast with the manure spreader and ploughed under. The ground was again gone over with the spade, springtooth and smoothing harrows, and put into good tilth.

Four varieties of corn of ¾ acres each were planted. One-third of each variety was fertilized in addition to the manure with 400 lbs. of fertilizer per acre; one-third with 200 lbs. per acre, and the other third manure only. The fertilizer was scattered broadcast and harrowed in. Each plot of ¼ acre was six rows running the entire length of the field.

The first frost on September 1, which was much earlier than usual, damaged the crop slightly; while a severe frost on September 23 of 9° did considerable damage, and very materially reduced the yield per acre. The following table gives the name of variety sown, how treated, and yield per acre:—

FIELD CROP OF CORN—FERTILIZER EXPERIMENTS.

Name of Variety, how fertilized, size of plot, and when cut.	Yield per Acre.	
	Tons.	Lbs.
Angel of Midnight.		
Cut Sept. 27th.		
¼ acre—Manure and Bowker's 'Square' brand fertilizer, 400 lbs. per acre	13	420
¼ " " " " 200 " "	12	600
¼ " Manure only, 20 tons per acre	11	1,560
Compton's Early.		
Cut Sept. 30th.		
¼ acre—Manure and Bowker's 'Square' brand fertilizer, 400 lbs. per acre	12	40
¼ " " " " 200 " "	11	1,720
¼ " Manure only, 20 tons per acre	11	1,660
Longfellow.		
Cut Sept. 29th.		
¼ acre—Manure and Bowker's 'Square' brand fertilizer, 400 lbs. per acre	11	760
¼ " " " " 200 " "	10	1,960
¼ " Manure only, 20 tons per acre	12	1,100
South Dakota.		
Cut Sept. 29th.		
¼ acre—Manure and Bowker's 'Square' brand fertilizer, 400 lbs. per acre	12	300
¼ " " " " 200 " "	12	1,700
¼ " Manure only, 20 tons per acre	12	40

CORN SOWN AT DIFFERENT DISTANCES APART.

Experiments were again conducted this year with corn planted in rows at different distances apart. Three varieties of corn were used. The corn was planted June 13 and harvested October 4. The plots were each one-fortieth acre. The ground was similar to that on which the field corn was grown and received the same cultivation and the same amount of manure per acre. In addition to this 400 lbs of complete fertilizer per acre was used on these plots. The yield was as follows:—

Name of Variety.	Distance Apart.	Yield per acre.	
	Inches.	Tons.	Lbs.
Selected Leaming	42	5	293
" "	35	5	1,550
" "	28	7	350
" "	21	8	1,860
Longfellow	42	9	1,552
"	35	12	750
"	28	13	1,335
"	21	14	1,798
Champion White Pearl	42	7	758
" "	35	9	1,200
" "	28	11	1,714
" "	21	12	1,756

EXPERIMENTS WITH TURNIPS.

The land chosen for the turnip plots was in grain the previous season, having been in roots in 1902, for which crop 30 one-horse cart-loads of stable manure per acre was used. It was ploughed in the fall and worked up this spring once with the spade harrow and manured at the rate of 25 one-horse cart-loads of stable manure per acre and ploughed. This was worked up with the spade harrow again and once with the springtooth. Complete fertilizer at the rate of 400 lbs. per acre was sown broadcast, and harrowed in with the smoothing harrow. The ground was run into rows 24 inches apart. The rows were raked off by hand, and the plots planted with the Planet Jr., seed drill No. 5. The plants were thinned to about one foot apart in the rows. The soil was a light clay loam. The plots were sown May 30, and a duplicate set planted June 13. Twenty varieties were included in the test. The crops on both sets of plots were pulled October 24, and the yield per acre calculated from the weight obtained from 2 rows each of 66 feet long. Continued dry weather from the time of sowing up to July 21 resulted in the plants making poor progress. Some plants were destroyed by cut-worms. The latter part of the season was favourable for growth.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre 1st Plot Sown.		Yield per Acre 1st Plot Sown.		Yield per Acre 2nd Plot Sown.		Yield per Acre 2nd Plot Sown.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Perfection Swede	40	335	1,339	15	34	1,300	1,155	..
2	Jumbo	39	375	1,306	15	35	785	1,179	45
3	Good Luck	38	1,880	1,298	..	35	125	1,168	45
4	Carter's Elephant	38	1,220	1,287	..	32	350	1,072	30
5	Hartley's Bronze	38	625	1,277	5	34	475	1,141	15
6	Emperor Swede	37	1,900	1,265	..	35	950	1,182	30
7	Selected Purple Top	37	1,735	1,262	15	30	1,875	1,031	15
8	Kangaroo	37	745	1,245	45	33	1,980	1,133	..
9	Drummond Purple Top	37	250	1,237	30	31	1,855	1,064	15
10	Magnum Bonum	36	1,425	1,223	45	34	145	1,135	45
11	Mammoth Clyde	35	1,775	1,196	15	33	825	1,113	45
12	Hall's Westbury	35	950	1,182	30	33	1,650	1,127	30
13	Sutton's Champion	35	785	1,179	45	33	1,155	1,119	15
14	Halewood's Bronze Top	35	455	1,174	15	33	..	1,100	..
15	Imperial Swede	34	1,300	1,155	..	31	700	1,045	..
16	Skirvings	33	1,980	1,133	..	28	925	948	45
17	Bangholm Selected	32	1,175	1,086	15	28	255	937	35
18	Elephant's Master	31	1,855	1,064	15	33	495	1,108	15
19	New Century	31	205	1,036	45	31	1,525	1,058	45
20	East Lothian	30	1,545	1,025	45	29	575	976	15

FIELD CROP OF TURNIPS—FERTILIZER EXPERIMENTS.

Seven acres of turnips were sown June 10 and 14 on soil of a light clay loam character. The soil was the same as that on which the field corn and mangels were grown. One-third running across one end of the field was in clover the previous year, in grain in 1902, and roots in 1901, for which crop 30 one-horse cart-loads of stable manure per acre was used. One-third running across the centre of the field was in grain last year, having been manured in 1902 for roots at the rate of 35 one-horse cart-loads per acre, and one-third running across the other end of the field was in roots last year, having been manured for that crop with 35 one-horse cart-loads of stable manure per acre. The rows ran lengthwise of the field across each of these three differently treated pieces of land. The pieces on which clover and oats were grown

were ploughed last fall, and the root piece was not ploughed until this spring. This spring the whole field was worked up by going over it once each with the disc and spade harrows, after which stable manure at the rate of 20 tons per acre was scattered broadcast with the manure spreader and ploughed under. The ground was again gone over with the spade, springtooth, and smoothing harrows and put into a good state of tilth.

Five acres were sown with a different variety for each acre. One-third of each acre was fertilized in addition to the manure (20 tons per acre) with Bowker's square brand complete fertilizer, at the rate of 500 lbs. per acre; one-third 250 lbs. per acre, and another one-third of each manure only. Two additional acres were sown with one variety. On one-third of each acre there was added to the manure fertilizers at the rate of 1,000 lbs. per acre; one-third of each acre at the rate of 500 lbs. per acre, and one-third of one acre was left for manure only, and one-third of the other acre was given an additional coat of 20 tons stable manure per acre, making a total of 40 tons. Each plot was 8 rows running the entire length of the field, or one-third of an acre. The first part of the summer was so extremely dry that the roots made poor growth. They made fair growth after the first of August. The cutworm also did considerable damage. The following table gives the name of variety sown, how treated, date of harvesting and yield per acre:—

FIELD CROP OF TURNIPS—FERTILIZER EXPERIMENTS.

Name of Variety, how Fertilized, size of Plot, and date when pulled.	Yield per Acre.		Yield per Acre.	
Hartley's Bronze Top.	Tons.	Lbs.	Bush.	Lbs.
(Pulled October 21.)				
⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre..	28	55	934	15
⅓ " " " " 250 " ..	27	1,725	928	45
⅓ " " alone, 20 tons per acre....	24	285	804	45
Purple Top Swede.				
(Pulled October 20.)				
⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre..	20	785	679	45
⅓ " " " " 250 " ..	21	1,770	729	30
⅓ " " alone, 20 tons per acre....	21	630	710	30
Carter's Elephant.				
(Pulled November 16.)				
⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre..	25	1,015	850	15
⅓ " " " " 250 " ..	26	935	882	15
⅓ " " alone, 20 tons per acre....	24	1,140	819	..
Kangaroo.				
(Pulled October 19.)				
⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre..	21	405	706	45
⅓ " " " " 250 " ..	20	770	679	30
⅓ " " alone, 20 tons per acre....	18	285	604	45
Empress Swede.				
(Pulled October 21.)				
⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre..	19	565	642	45
⅓ " " " " 250 " ..	19	976	649	36
" " alone, 20 tons per acre....	17	1,760	596	..

FIELD CROP OF TURNIPS—FERTILIZER EXPERIMENTS.—*Concluded.*

Name of Variety, how Fertilized, size of Plot, and date when pulled.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Purple Top Swede. (Pulled November 7.)				
⅛ acre—Manure and 'Thomas' Phosphate Powder, 1,000 lbs per acre.......	28	250	937	30
⅛ " " " " 500 "	28	925	948	45
⅛ " " alone, 20 tons per acre..........	26	1,175	886	15
Purple Top Swede. (Pulled November 2.)				
⅛ acre—Manure and Pidgeon's 'Intense' brand fertilizer, 1,000 lbs. per acre.	26	1,850	897	30
⅛ " " " " 500 " ..	24	1,230	820	30
⅛ " " alone, 40 tons per acre..........	27	1,275	921	15

EXPERIMENTS WITH MANGELS.

The ground selected for the mangel plots was a light clay loam. It was in clover the previous year, in grain in 1902, and in roots in 1901, for which crop 30 one-horse cart loads of stable manure per acre was used. The clover sod was ploughed last fall and this spring was worked up with the spade harrow and manured with 25 one-horse cart loads of stable manure per acre, which was ploughed in and worked up with the spade and springtooth harrows. Complete fertilizer at the rate of 400 lbs. per acre was sown broadcast and harrowed in with the smoothing harrow, after which rows were run 24 inches apart. The plots were sown May 30, and a duplicate set on June 13. The rows were raked off and the seed sown with the Planet Jr., hand seed drill. The crop was harvested October 12. The yield per acre has been determined from the weight obtained from two rows, each 66 feet long. The mangel crop suffered considerably from the ravages of the cutworm. The early-sown plot of Prize Winner Yellow Globe was so badly destroyed that reliable weights could not be obtained. The continued dry weather until after the middle of July also prevented satisfactory growth, while the latter part of the season was fairly suitable.

MANGELS—TEST OF VARIETIES.

No.	Name of Variety	Yield per Acre. 1st Plot Sown.		Yield per Acre. 1st Plot Sown.		Yield per Acre. 2nd Plot Sown.		Yield per Acre. 2nd Plot Sown.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Yellow Intermediate..........	40	1,015	1,350	15	31	1,525	1,058	45
2	Mammoth Yellow Intermediate..........	36	435	1,207	15	30	1,380	1,023	
3	Lion Yellow Intermediate..........	33	660	1,111		31	535	1,042	15
4	Giant Yellow Intermediate	33	495	1,108	15	27	285	904	45
5	Giant Sugar Mangel..........	28	1,090	951	30	24	530	808	50
6	Half Long Sugar White..........	26	305	871	45	25	490	841	30
7	Half Long Sugar Rosy..........	25	1,810	863	30	24	510	808	30
8	Leviathan Long Red..........	25	490	841	30	21	900	715	
9	Giant Yellow Globe..........	22	1,870	764	30	22	550	742	30
10	Selected Yellow Globe..........	22	1,540	759		21	735	712	15
11	Prize Mammoth Long Red..........	21	1,395	723	15	24	1,005	816	45
12	Selected Mammoth Long Red..........	20	1,085	684	45	20	590	676	30
13	Gate Post..........	20	425	673	45	25	1,480	858	
14	Mammoth Long Red..........	19	1,600	660		18	630	610	30
15	Triumph Yellow Globe..........	19	280	638		19	610	643	30
16	Prize Winner Yellow Globe..........					15	855	514	15

FIELD CROP OF MANGELS—FERTILIZER EXPERIMENTS.

Four acres of mangels were sown June 4 and 9 on soil of a light clay loam character. This land was adjoining that on which the corn and turnips were grown. One-third running across one end of the field was in clover the previous year, in grain in 1902, and in roots in 1901, for which crop 30 one-horse cart loads of stable manure per acre was used. One-third running across the centre of the field was in grain last year, having been manured in 1902, for roots, at the rate of 35 one-horse cart loads per acre, and one-third running across the other end of the field was in roots last year, having been manured for that crop with 35 one-horse cart loads of stable manure per acre. The rows ran lengthwise across each of these differently treated pieces of the field. The pieces on which clover and oats were grown last year were ploughed in the fall, but the root piece was not ploughed until this spring. This spring the whole field was worked up by going over it once each with the disc and spade harrows, after which stable manure at the rate of 20 tons per acre was scattered broadcast with the manure spreader and ploughed under. The ground was again gone over with the spade, springtooth, and smoothing harrows, and put into a good state of tilth.

Four varieties of mangels were sown. One-third acre of each was fertilized, in addition to the manure, with 500 pounds of fertilizer per acre. One-third with 250 pounds of fertilizer per acre in addition to the manure, and the other third, manure only. The fertilizer was scattered broadcast before the land was run up into rows 24 inches apart. The seed was sown with the hand seed drill in bunches one foot apart. Each plot was one-third acre, or eight rows running the entire length of the field. This field did not make a satisfactory growth, owing to the extremely dry weather prevailing during the first part of the season. The later growth was fair. The cutworm did considerable damage. The following table gives results obtained.

FIELD CROP OF MANGELS—FERTILIZER EXPERIMENTS.

Name of Variety, how Fertilized, size of Plot and date when pulled.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Mammoth Long Red.				
(Pulled October 13.)				
⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre...	14	80	468	..
⅓ " " " " 250 " ..	13	1,795	463	15
⅓ " " alone, 20 tons per acre......	12	585	409	45
Giant Yellow Half Long.				
(Pulled October 17.)				
⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre...	17	1,985	599	45
⅓ " " " " 250 " ..	15	30	500	30
⅓ " " alone, 20 tons per acre......	12	1,605	426	45
Giant Yellow Globe.				
(Pulled October 18.)				
⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre...	14	530	475	30
⅓ " " " " 250 " ..	12	1,395	423	15
⅓ " " alone, 20 tons per acre......	11	1,775	396	15
Giant Yellow Globe and Mammoth Long Red.				
(Seed mixed before planting.)				
⅓ acre—Manure and Bowker's 'Square' brand fertilizer, 500 lbs. per acre...	11	965	382	45
⅓ " " " " 250 " ..	12	855	414	15
⅓ " " alone, 20 tons per acre......	10	625	343	45

EXPERIMENTS WITH SUGAR BEETS.

Eight varieties of sugar beets were tested. These were on plots adjoining the mangel plots and received the same treatment in every particular. The dry weather prevailing during the early part of the season also prevented this crop from making good growth. The seed was sown May 30, and duplicate plots were sown June 13. The plots were each two rows, 66 feet long. The crop was harvested October 12. The following table gives the yield per acre obtained.

SUGAR BEETS—TEST OF VARIETIES.

No.	Name of Variety.	Yield per Acre. 1st Plot Sown.		Yield per Acre. 1st Plot Sown.		Yield per Acre. 2nd Plot Sown.		Yield per Acre. 2nd Plot Sown.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Red Top Sugar	26	140	869	..	27	1,440	924	..
2	Royal Giant	24	1,830	830	30	20	425	673	45
3	Improved Imperial	23	355	772	35	21	75	701	15
4	Wanzleben	22	880	748	..	18	1,455	624	15
5	Danish Improved	20	1,910	698	30	19	775	646	15
6	Danish Red Top	20	95	668	15	20	755	679	15
7	Vilmorin's Improved	18	795	613	15	16	1,330	555	30
8	French Very Rich	14	1,205	486	45	12	1,575	426	15

EXPERIMENTS WITH CARROTS.

Ten varieties of carrots were under test. They were grown in plots adjoining the turnip plots and received the same treatment in every particular. The seed was sown May 30, and duplicate plots were sown two weeks later, June 13. Each plot was two rows 66 feet long. The carrots also failed to make good growth owing to the dry weather prevailing during the first part of the summer. The crop was harvested October 25, and the following yields were obtained.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot Sown.		Yield per Acre. 2nd Plot Sown.		Yield per Acre. 1st Plot Sown.		Yield per Acre. 2nd Plot Sown.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth White Intermediate	21	1,890	731	30	18	1,620	627	..
2	Carter's Orange Giant	20	1,910	698	30	19	1,105	651	45
3	White Belgian	20	260	671	..	18	1,445	624	5
4	Long Yellow Stump-rooted	19	1,765	662	45	18	1,950	632	30
5	New White Intermediate	18	1,290	621	30	17	1,145	585	45
6	Giant White Vosges	18	960	616	..	16	340	539	..
7	Ontario Champion	18	630	610	30	18	960	616	..
8	Half Long Chantenay	18	465	607	45	17	1,970	599	30
9	Early Gem	17	1,475	591	15	16	1,330	555	30
10	Improved Short White	16	1,660	561	..	14	710	478	30

EXPERIMENTS WITH POTATOES.

The land on which the potatoes were grown was a clay loam. The previous crop was clover. The ground was manured early in the fall with stable manure at the

rate of 20 one-horse cart loads per acre and at once ploughed under. In the spring this was gone over with the spade and springtooth harrow and ploughed. It was again worked once each with the spade, springtooth and smoothing harrows. Rows were run 30 inches apart and about 4 inches deep and potato fertilizer at the rate of 400 lbs. per acre scattered along the rows before planting. The sets were dropped one foot apart in these rows and covered with the plough. The tubers were cut so as to have from 2 to 3 eyes in each set. The drills were harrowed down once before the plants were above the ground and again drilled up in a few days and the soil kept loose with the cultivator until the vines were quite large. The field was hoed once by hand. The plots were sprayed with Bordeaux mixture and Paris green on July 20, August 5 and August 26. There was no blight noticeable on these plots and the tubers were free from rot. Forty-five varieties were included in the test. They were planted May 31 and dug September 1 and 3. Each plot was two rows, each 66 feet long. They yielded as follows :—

POTATOES—TEST OF VARIETIES.

Number.	Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Un-marketable.		Form and Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Vick's Extra Early	Good	495	..	429	..	66	..	Long, round, white.
2	Carman No. 1	"	462	..	374	..	88	..	Flat, round, white.
3	Irish Cobbler	"	439	..	356	24	83	36	Round, white.
4	Pearce	"	424	36	358	36	66	..	Long, pink and white.
5	Green Mountain	"	418	..	319	..	99	..	Flat, round, white.
6	Country Gentleman	"	418	..	316	48	101	12	Long, pink and white.
7	Delaware	"	413	36	323	24	90	12	Flat, round, white.
8	Rochester Rose	"	409	12	352	..	57	12	Oblong, pink.
9	Rose No. 9	Medium	400	24	330	..	70	24	"
10	State of Maine	Good	398	12	316	48	81	24	Round, white.
11	Everett	"	396	..	297	..	99	..	Flat, round. white.
12	General Gordon	"	396	..	308	..	88	.	Oblong, pink.
13	Early St. George	"	391	36	275	..	116	36	"
14	Clay Rose	Medium	385	..	323	24	61	36	Round, pink.
15	I. X. L	Good	385	..	259	36	125	24	Long, pink and white.
16	Pingree	"	374	..	332	12	41	48	Oblong, white.
17	Early Norther	"	374	..	290	24	83	36	Long, pink and white.
18	Prolific Rose	"	369	36	275	..	94	36	Oblong, pink.
19	Maule's Thoroughbred	"	367	24	308	..	59	24	Long, pink.
20	Uncle Sam	"	363	..	281	36	81	24	Round, white.
21	Empire State	"	363	..	286	..	77	..	Long, white.
22	Dreer's Standard	"	356	24	264	..	92	24	Round, white.
23	Bovee	"	354	12	255	12	99	..	Oblong, pink and white.
24	Early Envoy	"	352	..	264	..	88	..	Long, pink.
25	Enormous	"	352	..	279	24	72	36	Round, white.
26	Penn Manor	"	352	..	259	36	92	24	Long, dark pink.
27	Burnaby Seedling	"	345	24	257	24	88	..	Long, pink and white.
28	Seedling No. 7	Medium	343	12	281	36	61	36	Oblong, pink.
29	Early Sunrise	Good	341	..	264	..	77	..	Long, round, pink.
30	Early White Prize	"	341	..	255	12	85	48	Long, white.
31	Early Michigan	"	341	..	231	..	110	..	Oblong, white.
32	Rawdon Rose	"	336	36	244	12	92	24	Round, pink and white.
33	Cambridge Russet	"	334	24	253	..	81	24	Oblong, white.
34	Canadian Beauty	"	332	12	257	24	74	48	Long, pink and white.
35	Money Maker	"	331	..	237	36	92	24	Long, white.
36	Late Puritan	"	323	24	233	12	90	12	Long, pink and white.
37	Early Andes	"	321	12	248	36	72	36	Round, pink.
38	American Giant	Medium	319	..	224	24	94	36	Long, pink.
39	Swiss Snowflake	Good	314	36	176	..	138	36	Oblong, white.
40	Reeves' Rose	"	312	24	246	24	66	..	Long, pink.
41	Sabean's Elephant	"	308	..	228	48	79	12	Long, white.
42	Early Rose	"	299	12	228	48	70	24	Long, pink.
43	Holborn Abundance	Medium	297	..	171	36	125	24	Oblong, white.
44	American Wonder	Good	253	..	198	..	55	..	Long, white.
45	Carman No. 3	"	242	..	213	24	28	36	Flat, round, white.

EXPERIMENTS TO TEST THE VALUE OF BUG DEATH AS COMPARED WITH PARIS GREEN AND BORDEAUX AND PARIS GREEN ON POTATOES.

Experiments were again conducted to test the comparative value of Bug Death, Paris green and Bordeaux Mixture and Paris green. The plots were alike in treatment of soil, date of planting, &c. The variety, Carman No. 1, was used. The soil was similar on all these plots and was treated in the same way. The plots were each 1-33 of an acre.

On one plot two applications of Bug Death were given, one on July 20 and one August 5. Four pounds of Bug Death was dusted on the plants at each application. The vines were quite large and this amount just nicely covered the leaves. It was applied in the early morning when the dew was on. Bugs were jnst commencing to feed at the time of the first application, and very few were noticed at the time of second application.

Paris Green and water at the rate of 1 oz. to 10 gallons of water, and one quart of lime water added, was applied by means of a spray pump to one plot, July 20 and August 5. At the time of the second application, about as many bugs were present on this plot as on the plot where Bug Death was used.

Poisoned Bordeaux Mixture, made of 4 lbs. bluestone, 4 lbs. lime, 4 ounces of Paris green and 40 gallons of water, was sprayed on a third plot July 20, August 4 and August 26. As many bugs were noticed at the time of the second application as were on the other two plots. No bugs were present at the time of the third application.

The Bug Death was quite as effective in killing the bugs as either the Paris green or poisoned Bordeaux. No blight was noticeable on any of these plots. The following yields per acre have been calculated from the weight of tubers taken from each of these plots of 1-33 of an acre:—

How treated.	Yield per acre. Bush.	Yield per acre. Lbs.
Bordeaux and Paris green	356	24
Bug Death	340	16
Paris green	319	..

MATERIALS USED AND COST PER ACRE.

Bug Death Plot.

1st application, 132 lbs. per acre, at 7c. per lb.	$ 9 24
2nd application, 132 lbs. per acre, at 7c. per lb.	9 24
	$18 48

Paris Green Plot.

4 lbs. Paris green at 25 cts. per lb.	$ 1 00

Bordeaux and Paris Green Plot.

50 lbs. bluestone at 8 cts. per lb.	$ 4 00
50 lbs. rock lime at 1 ct. per lb.	50
4 lbs. Paris green at 25 cts. per lb.	1 00
	$5 50

EXPERIMENTS WITH SOJA BEANS AND HORSE BEANS.

Experiments were again conducted with Soja beans and Horse beans to test their relative value as forage crops, and also the yield per acre when grown in rows at different distances apart. The plots were 1-10 acre each. The soil was a clay loam in a good state of fertility. The seed was sown June 13. Many of the plants of both these plots were destroyed by the cutworms. The 'Black Dolphin' aphis destroyed the remaining plants of Horse Beans, and a frost September 1 killed the Soja Beans, making it impossible to obtain any reliable data from either of these plots.

EXPERIMENTS WITH ALFALFA.

A one-fortieth acre plot of Alfalfa was sown early in June, 1902, with barley as a nurse-crop. The nurse-crop was cut early in August. The plants only made fair growth and during the following winter were all killed out except a few plants. These made very poor growth during the season of 1903, and now only two weak plants remain.

In 1903 a similar plot was sown early in June. Wheat being used as a nurse-crop, was left uncut and allowed to remain as a protection to the plants during winter. The Alfalfa plants made a good start and nearly all came through the winter, but were in a sickly condition and made very poor growth this season. A few odd plants of Red clover that happened by chance to get into this plot lived through the winter and made exceptionally good growth. This plot was cut twice through the summer, at which times the Alfalfa was only from 4 to 6 inches high, while the few plants of Red clover in this plot were at least three times their height and weight. The soil of these two plots was a heavy clay, underdrained, in a fair state of fertility and well cultivated before sowing.

This season a plot of 1-10 acre of Alfalfa was sown. The soil was a heavy clay, underdrained, and in a good state of fertility. This land was plowed May 13 and well worked up. It was again worked May 29, June 20 and 29 with the springtooth and smoothing harrows. On July 7 this ground was again worked with the spade, springtooth and smoothing harrows and Alfalfa sown at the rate of 25 lbs. per acre with the grain seed drill. One-half of the plot was sown with wheat at the rate of 2 bushels per acre as a nurse-crop, and the other half with Alfalfa alone. The Alfalfa on the plot without a nurse-crop made a much more satisfactory growth than that with the nurse-crop, and was much better than that of any former year. On October 20 the growth of that sown alone averaged 10 to 12 inches, and that with the nurse-crop averaged only 5 to 7 inches. The nurse-crop, which made a growth of about 24 inches, was allowed to remain as a protection during winter.

MILLET.

Six varieties of millet were grown on land that was in grain last year. The ground was manured last fall at the rate of 15 one-horse cart loads per acre and ploughed under this spring. This ground was again ploughed and worked up with the disc, springtooth and smoothing harrows. The seed was sown June 15 with the Planet Jr. hand drill in plots of one-fortieth acre each. The crop was cut August 29, while still in a green state for feed. The yield per acre is for green feed when cut.

	Tons.	Lbs.
Moha Green California	14	750
Italian or Indian	10	350
Pearl or Cat Tail	7	
White Round French	5	1,750
Algerian	5	1,050
Moha Hungarian	5	250

CLOVER EXPERIMENTS.

Experiments were again conducted this season for the purpose of determining the gain, if any, from growing clover with grain crops for the purpose of turning under the growth made during the season for the benefit of future crops. The ground was the same as that on which similar clover experiments were conducted last season. The soil was a clay loam in a fair state of fertility. Three kinds of grain were sown and each of these series of plots were treated the same. Six plots were seeded down at the time the grain was sown, May 31, with Mammoth Red clover at the rate of 10 pounds per acre, and six with grain alone without clover. These plots were sown in a similar manner last season, and those seeded to clover this year had been seeded to clover last year, and those not seeded to clover this season had not been seeded to clover last year. The ground was ploughed in the fall and this spring was worked up with the disc, springtooth and smoothing harrows and the seed sown with the seed drill. The growth of clover on these plots was very light in 1903, consequently no very great difference in the yield per acre of grain from them this year could be expected. The clover on the plots seeded to clover was again unusually light and although starting well was killed out badly by the continued dry weather during June and July. Late sown grain rusted badly; especially was this the case with late sown wheat. The White Fife series of plots were so badly rusted that the crop was not worth threshing for the grain alone. The wheat was cut August 30; the oats, August 31; and the barley, August 27. The plots were one-fortieth acre each and gave the following yields per acre.

EXPERIMENTS WITH CLOVER SOWN WITH GRAIN.

Name of Variety of grain and how seeded.	Yield per Acre.	
White Fife Wheat.	Bush.	Lbs.
No. 1—Without clover	6	40
" 2—With clover	6	50
" 3—Without clover	6	20
" 4—With clover	5	10
Waverley Oats.		
No. 1—Without clover	54	24
" 2—With clover	62	32
" 3—Without clover	57	2
" 4—With clover	60	20
Odessa Barley.		
No. 1—Without clover	20	20
" 2—With clover	23	26
" 3—Without clover	27	4
" 4—With clover	27	24

SPECIAL EXPERIMENTS WITH FERTILIZERS.

Special experiments with fertilizers of various kinds commonly used for field crops have been conducted for the past five years. It was decided that the further fertilizing of these plots should be abandoned and the land seeded to grain for some years, to determine the extent to which these fertilizers already applied would continue to supply the crop with the required plant food. Accordingly the field was seeded entirely to grain. Mammoth Red clover was sown on one-half of the field at the rate of 10 pounds per acre at the same time. The other half was not seeded to clover.

The plots were one-eighth acre each on which fertilizers of different kinds had been previously applied. These plots were divided into ten strips 14 feet wide, each running lengthwise across all the different fertilized plots. These strips were sown with five different kinds of grain: namely, oats, wheat, barley, pease and mixed grain. A margin of two feet was left between each plot, and one foot between each crop plot. The yield from these plots is given in the following table:

Fertilizers used each Year during the past Five Years, per Acre.	Tartar King Oats with Clover.		Tartar King Oats without Clover.		Colorado Wheat with Clover.		Colorado Wheat without Clover.		Standwell Barley with Clover.		Standwell Barley without Clover.		Mixed Grain with Clover.		Mixed Grain without Clover.		Pease, Golden Vine, with Clover.		Pease, Golden Vine, without Clover.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
1 Manure, 30 tons	67	22	85	10	16	40	22	30	50	..	56	12	57	20	60	..	29	10	30	..
2 Manure, 15 tons, fertilizer, 250 lbs	72	2	73	18	20	..	19	10	52	4	51	2	61	10	65	..	30	50	35	..
3 Complete fertilizer; 1,000 lbs	44	4	47	2	15	..	15	50	35	20	27	4	41	10	40	..	24	10	28	20
4 " 500 lbs	45	20	41	6	12	30	14	10	33	16	24	18	37	20	45	..	21	40	20	..
5 Check. No fertilizer used	36	26	38	8	10	..	10	50	22	44	27	4	42	20	42	20	15	..	13	20
6 Bone-meal, 1,000 lbs	52	32	48	18	11	40	11	40	33	16	29	8	43	30	41	10	25	..	22	30
7 " 500 lbs	41	6	52	32	10	50	11	40	31	12	37	24	37	20	45	..	30	..	26	40
8 Ashes, 2,500 lbs	47	2	55	30	11	40	12	5	43	36	46	42	35	..	47	20	28	20	27	30
9 Manure, rotted, 20 tons	66	6	73	18	15	50	17	30	54	8	50	..	56	10	65	..	29	10	31	40
10 Check. No fertilizer used.	33	28	29	14	6	40	7	30	20	40	22	44	30	.	27	20	16	40	11	40
11 Land plaster, 500 lbs	38	8	32	12	8	20	10	..	19	38	18	30	35	..	32	20	15	50	14	10
12 Salt, 500 lbs	42	22	39	24	10	50	13	20	25	..	30	10	41	10	35	..	25	..	23	20
13 Marsh mud, 100 tons	55	30	54	14	18	20	15	50	36	22	37	24	57	20	55	..	31	40	26	40
14 Manure, green, 20 tons	88	8	82	12	20	50	18	20	60	20	58	16	67	20	63	30	35	50	32	30

EXPERIMENTS WITH FERTILIZERS ON WHEAT.

Experiments were conducted this year with wheat fertilized with different fertilizing materials. The variety Australian No. 19 was used. The seed was sown at the rate of $1\frac{3}{4}$ bushels per acre, June 1, and was harvested September 3. The ground on which this wheat was grown is a clay loam, and was previously in roots, having been manured with 30 one-horse cart loads of stable manure for that crop. The land was ploughed this spring and subsequently worked into good tilth. The growth of straw averaged 40 inches. This crop was practically ruined by rust.

HAY.

The crop of clover and timothy hay was light, being fully one-third less than an average crop. Six acres of upland yielded 13 tons 1,165 lbs., and a 11-acre field yielded 24 tons 1,710 lbs. One acre of Awnless Brome yielded 1 ton 1,250 lbs. The 12 acres of underdrained marsh produced 15 tons 700 lbs., and the 35 acres not underdrained yielded 37 tons 1,270 lbs. This made a total of 93 tons 95 lbs.

SUMMARY OF CROPS GROWN ON THE EXPERIMENTAL FARM THIS SEASON.

Grain Field Crops.	Bush.	Lbs.
Oats	181	18
Barley	27	26
Mixed grain	412	23
Buckwheat	64	..
	685	27

Field of Turnips, Experimental Farm, Nappan.

Grain from Trial Plots.	Bush.	Lbs.
Oats	92	11
Barley	52	45
Wheat	25	2
Pease	27	44
	198	22

Roots, &c., Field Crops.	Bush.	Lbs.
Turnips	5,540	2
Mangels	1,767	55
	7,307	57

From Trial Plots.	Bush.	Lbs.
Turnips	277	34
Mangels	157	26
Carrots	74	12
Sugar Beets	66	16
Potatoes—marketable	116	15
Potatoes—not marketable	26	55
	718	38

Corn for Ensilage.	Tons.	Lbs.
Field crop	36	440
From trial plots	12	1,342
	48	1,782

SUMMARY OF FEED USED.

Summary of feeds used in connection with stock on farm, July 1, 1903, to June 30, 1904 :—

—	Hay.	Grain or Meal.	Corn or Roots.
	Lbs.	Lbs.	Lbs.
Grown on farm	205,272	52,686	640,560
Purchased	51,606	153,200	
Received by exchange	5,600	18,500	
Total	262,478	224,386	

The meal consumed consisted of oats, 37,094 lbs.; bran, 39,200 lbs.; middlings, 40,400 lbs.; mixed grain (oats, pease and barley), 34,104 lbs.; gluten meal, 30,000 lbs.; pea meal, 9,000 lbs.; oil cake, 8,500 lbs.; corn meal, 6,400 lbs.; moulie, 7,000 lbs.; wheat chop, 4,000 lbs.; buckwheat, 5,976 lbs.; barley, 2,712 lbs. Total, 224,386 lbs.

DISPOSITION OF FEEDS.

Disposition of feed harvested, and purchased for use of live stock on farm, July 1, 1903, to June 30, 1904:—

Class fed.	Grain or Meal.	Corn or Roots.	Hay.	Grain or Meal.	Corn or Roots.	Hay.
	Lbs.	Lbs.	Lbs.			Weighed at intervals and amount calculated from said weighings.
8 horses	41,200	......	58,400	Weighed ...	Weighed ...	
27 steers	27,210	214,350	59,292	"	"	
10 young steers	4,350	66,750	10,780	"	"	
21 cows (winter)	39,690	159,500	56,700	"	"	
27 cows (summer)	20,250	......	10,125	Estimated..		
22 young stock	20,500	113,400	40,500	"	"	
Calves under 1 year	1,500	......	......	Weighed ...		
3 bulls	4,000	......	6,000	"		
Poultry	2,000	......	......	Estimated..		
18 sheep	3,240	2,000	6,480	Weighed ...	"	
70 swine	38,000	......	......	"		
Seed	5,000	......	......	"		
On hand July 1	7,000	......	......	"		
Total account	213,940	556,000	248,277			
Amount harvested	224,386	640,560	262,478			
Shrinkage	10,446	84,560	14,201			
% Shrinkage	4·65%	13·20%	5·41%			

GRAIN AND POTATO DISTRIBUTION.

Some of the most promising varieties of grain and potatoes were again distributed this year free to farmers who made application. The following number of packages of 3 lbs. each were sent out:—

Oats	198
Barley	65
Wheat	72
Pease	51
Buckwheat	25
Potatoes	331
Total	742

HORSES.

The stock of horses at present on the farm consists of three teams of heavy working horses, one express horse and one driver. There have been no changes during the year. All are in good condition.

CATTLE.

The herd of dairy cattle on the farm at present, of all ages and breeds, numbers 49 head as follows:—

1 Guernsey bull, 6 years old.
1 Ayrshire bull, 1½ years old.
1 Ayrshire bull calf.
2 Guernsey cows.
6 Ayrshire cows.
3 Holstein cows.
14 Grade cows.
1 Guernsey heifer, 1 year old.
5 Ayrshire heifers, 1 to 2 years old.
1 Holstein heifer, 1 year old.
7 Grade Ayrshire heifers, 1½ years old.
1 Ayrshire heifer calf.
2 Holstein heifer calves.
4 Grade heifers, Ayr. and Guernseys.

The steers on hand and in experiments number 34 head, as follows:—

8 three-year-old steers, short-horn grades.
8 two-year-old steers, short-horn grades.
8 one-year-old steers, short-horn grades.
10 steer calves, short-horn grades.

EXPERIMENT WITH DAIRY COWS.

This experiment was carried on as in former years, to further determine the profit or loss of a fairly good dairy herd, well fed and cared for, with the feeds consumed charged at current market prices, and receiving credit for milk produced, the value of which being established by the price received at the creamery during the season.

The different feeds were charged at the following prices: Wheat bran, $20 per ton; oats, $24 per ton; oil cake, $34 per ton; gluten-meal, $28.50 per ton; making an average price of mixed meal ration, as per proportion fed to cows, of 1⅛c. per pound. Roots at $2 per ton, ensilage at $2 per ton, and hay at $8 per ton.

The ration fed to cows in full milk was: Ensilage or roots, 50 lbs.; meal, 9 lbs.; hay, 10 lbs.; making a cost of 19⅝ cents per cow per day.

In summer months, while milking, they were charged $2.50 per month, and when dry, $1 per month.

When dry in winter they were charged $3 per month. Different quantities were fed to different cows, according to their capacity to consume and produce, or period of lactation, and charged accordingly.

They were kept in the stable from November 1, 1903, to June 1, 1904, except on occasional fine days, when they were allowed out in the yard.

From June 1 to November 1, they were put out in the field the greater part of the time, night and day, but kept in during cold or wet weather.

They were fed, watered and milked each day at as nearly regular intervals as possible, and by the same persons.

The summer feed was practically all summer soiling crops, rye, clover, or oats, pease and vetches grown together and sown at different times after July 15. They were fed some hay, and after August 15, green corn.

The milk of each cow was weighed at milking twice each day, and a careful record kept of the number of pounds given.

The percentage of fat in the milk of each cow was determined by the Babcock milk tester, and the fat credited to the cow; on the basis that 85 pounds of fat produces 100 pounds of marketable butter.

The milk was sent to the Nappan dairy station, and the cows were credited with the butter produced at the prices paid to all patrons of that station, which averaged for the winter months 24 4-7 cents per pound, and for the summer months 20⅝ cents per pound, less 4 cents per pound for manufacturing and hauling milk, leaving 20 4-7 cents per pound for wintor butter and 16⅝ cents per pound for summer butter.

The skim-milk was fed to calves and pigs, and credited to the cows at the rate of 15 cents per 100 pounds.

Of the 27 cows on hand December 1, 1903, only 21 are reported as in milk. Of the remainder, one died, some failed to breed ,and others were old and disposed of.

The following table will show the results obtained during the year:—

RECORD OF DAIRY COWS.

Name.	Age.	Breed.	Date of dropping last Calf.	Days in Milk.	Quantity of Milk.	Fat.	Butter.	Value of Skim-milk.	Total Credit.	Cost of Feed.	Cost of Making Butter at 4c. per lb.	Total Cost	Profit.
	Yrs.				Lbs.	p. c.	Lbs.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Corie	7	Ayrshire Grade	Jan. 10, 1904	290	7,070	3·7	307·75	7 07	77 85	47 22	12 31	59 53	18 32
Ilda Rooker	5	Holstein	" 16, 1904.	300	7,300	3·4	292·00	7 30	74 46	48 20	11 68	59 88	14 58
Yellow Kate	4	Ayrshire	Feb. 1	280	6,700	3·6	283·76	6 70	71 96	46 24	11 35	57 59	14 37
Rex's Maud	9	Guernsey	Jan. 20, 1904.	280	5,260	4·5	278·47	5 26	69 30	46 24	11 15	57 37	11 93
Aitow	9	Ayrshire Grade	" 1, 1904.	300	6,120	3·9	280·80	6 12	70 70	48 20	11 23	59 43	11 27
Carrie	11	"	Mar. 1, 1904.	270	6,050	3·7	263·35	6 05	66 62	45 26	10 53	55 79	10 83
Curly	5	Ayrshire Gn. Grade	Feb. 1, 1904.	300	6,010	3·9	275·75	6 01	69 43	48 20	11 03	59 23	10 20
Sonsy	8	Ayrshire	" 10, 1904.	290	6,300	3·6	266·82	6 30	67 66	47 22	10 67	57 89	9 77
Rae	3½	Ayrshire Gn. Grade	Jan. 1, 1904.	300	5,640	4·0	265·41	5 64	66 68	46 40	10 61	57 01	9 67
Lida Rooker	4	Holstein	" 1, 1904.	300	6,590	3·3	255·84	6 59	65 43	48 20	10 23	58 43	7 00
Daisy	9	Ayrshire Grade	Mar. 1, 1904.	270	5,430	3·6	229·88	5 43	58 30	43 93	9 19	53 12	5 18
Lizzie	3½	Ayrshire G. Grade	Dec. 15, 1903.	310	5,210	3·8	232·91	5 21	58 77	45 26	9 31	54 57	4 20
Jessie P	10	Ayrshire Grade	May 15, 1904.	285	5,300	3·8	236·94	5 30	59 79	46 73	9 47	56 20	3 59
Bluebell	3½	"	Dec. 30, 1903.	210	4,700	3·7	204·58	4 70	51 75	41 90	8 18	50 08	1 67
Sarah	3½	Ayrshire	Feb. 15, 1904.	255	4,740	3·7	206·35	4 74	52 20	42 53	8 25	50 78	1 42
Norah	2½	"	Jan. 1, 1904.	270	4,760	3·8	212·80	4 76	53 70	43 82	8 51	52 33	1 38
Beatrice	5	"	Sept. 1, 1903.	210	4,880	3·7	212·42	4 88	53 73	44 48	8 49	52 97	0 76
Molly	11	Sh. Ayrshire Grade	Feb. 6, 1904.	295	4,950	3·8	221·29	4 95	55 84	47 21	8 85	56 06	*0 22
Maggie	2½	Ayrshire Grade	Jan. 1, 1904.	240	4,510	3·8	201·62	4 51	50 87	43 40	8 06	51 46	0 59
Winnie	3½	Ayrshire Gn. Grade	" 1, 1904.	300	4,540	3·9	208·30	4 54	52 44	45 40	8 32	53 72	1 28
Betsy	3½	Ayrshire Grade	" 10, 1904.	260	4,680	3·6	198·21	4 68	50 26	44 04	7 92	51 96	1 70

*Loss.

EXPERIMENTS WITH STEERS.

TIED IN STALLS VS. FED IN LOOSE BOX.

This experiment was again carried on with the view of testing the advisability of feeding in loose boxes, as contrasted with similar steers fed tied in stalls.

Sixteen three-year-old steers were used for this test in two lots of eight each, of as nearly as possible equal form, fatness and weight (short-horn grades).

All weights were taken after a fast of fourteen hours, that is, at 9 a.m., without feed.

All were dehorned previous to beginning of test, and by careful weighing, both before and after dehorning, it was found that an average loss of 25 pounds per steer was sustained, requiring from 10 days to two weeks to regain.

All lots were fed alike, as nearly as possible, from start to finish of test, and kept in the stable all the time, except on occasional fine days, when they were let out for a time, averaging not more than once a week. The feeds were charged at the following prices : Hay, $8 per ton; roots, $2 per ton; ensilage, $2 per ton; mixed meals averaged $24 per ton; as per proportion fed.

The result of this experiment again shows slightly more gain for those fed in loose box stalls, than for those tied up, with a decided advantage as to the labour required, while the amount of straw required for loose steers is at least 50 per cent more than for those tied up.

Following are the results obtained :—

RECORD of steers, fed from November 16, 1903, to April 30, 1904.

LOT I.—DEHORNED, FED IN LOOSE BOX.

Numbers.	Nov. 16.	Dec. 1.	Gain.	Dec. 31.	Gain.	Jan. 30.	Gain.	Mar. 1.	Gain.	Mar. 31.	Gain.	Apr. 30.	Gain.	Total Gain.
	Lbs.	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.
9...	1,075	1,115	40	1,195	80	1,265	70	1,315	50	1,350	35	1,380	30	305
10...	1,230	1,260	30	1,320	60	1,370	50	1,410	40	1,440	30	1,450	10	220
11...	1,220	1,260	40	1,330	70	1,380	50	1,440	60	1,480	40	1,510	30	290
12...	1,140	1,180	40	1,240	60	1,300	60	1,350	50	1,390	40	1,410	20	270
13...	1,065	1,100	35	1,175	75	1,225	50	1,265	40	1,305	40	1,340	35	275
14...	1,340	1,390	50	1,470	80	1,530	60	1,590	60	1,640	50	1,675	35	335
15...	1,275	1,325	50	1,405	80	1,475	70	1,525	50	1,565	30	1,595	30	320
16...	1,000	1,040	40	1,130	90	1,190	60	1,240	50	1,280	40	1,310	30	310
	9,345	9,670	325	10,265	595	10,735	490	11,135	400	11,450	315	11,670	220	2,325

LOT II.—DEHORNED, TIED IN STALLS.

1...	1,415	1,465	50	1,545	80	1,605	60	1,645	40	1,695	50	1,725	30	310
2...	1,300	1,340	40	1,400	60	1,450	50	1,495	45	1,525	30	1,560	35	260
3...	1,225	1,275	50	1,345	70	1,385	40	1,425	40	1,460	35	1,485	25	260
4...	1,130	1,180	50	1,260	80	1,300	40	1,350	50	1,390	40	1,415	25	285
5...	1,065	1,100	35	1,160	60	1,195	35	1,245	50	1,285	40	1,310	25	245
6...	1,175	1,220	45	1,300	80	1,360	60	1,400	40	1,440	40	1,475	35	300
7...	1,080	1,120	40	1,170	50	1,220	50	1,260	40	1,290	30	1,310	10	230
8...	1,070	1,100	30	1,160	60	1,200	40	1,250	50	1,275	25	1,305	30	235
	9,460	9,800	340	10,340	540	10,715	375	11,070	355	11,360	290	11,585	225	2,125

EXPERIMENT WITH STEERS—*Continued.*

Ex. 1.—Average cost of 1 steer per day for entire period.

Period.	Daily Ration.		Daily Cost.	Cost for period.	Total.
1903.		Lbs.	$ cts.	$ cts.	$ cts.
Nov. 16 to Dec. 1	Roots	90	0 09	1 35	
	Hay	10	0 04	0 60	
	Meal	2	0 02$\frac{2}{5}$	0 36	2 31
Dec. 1 to Dec. 31	Roots	60	0 06	1 80	
	Hay	10	0 04	1 20	
	Meal	4	0 04$\frac{4}{5}$	1 44	4 44
1904.					
Dec. 31 to Jan 30	Roots	40	0 04	1 20	
	Hay	10	0 04	1 20	
	Meal	5	0 07$\frac{1}{5}$	2 16	4 56
Jan. 30 to March 1	Roots	30	0 03	0 90	
	Hay	12	0 04$\frac{4}{5}$	1 44	
	Meal	7	0 08$\frac{2}{5}$	2 52	4 86
March 1 to March 31	Roots	30	0 03	0 90	
	Hay	15	0 06	1 80	
	Meal	8	0 09$\frac{3}{5}$	2 88	5 58
March 31 to April 30	Roots	20	0 02	0 60	
	Hay	15	0 06	1 80	
	Meal	8	0 09$\frac{3}{5}$	2 88	5 28
Cost of feed, 1 steer					27 03
" 16 steers					432 48

SUMMARY OF EXPERIMENT WITH STEERS.

Financial Part.

Original weight of 16 steers, 18,805 lbs., at 4$\frac{1}{8}$c. per lb.	$ 775 70
Weight at finish of 16 steers, 23,255 lbs., at 5 $\frac{40}{100}$ c. per lb.	1,255 77
Balance	480 07
Cost of feed for lot, 165 days	432 48
Net profit	47 59
Daily rate of gain per steer	Lbs. 1·68
Cost of 1 lb. gain	Cts. 9·71
Cost of feed per day per steer	" 16·38
Profit per steer	$2 97

It will be observed that an advance in price of 1·11 cents per lb. over buying price is required on a five months' feeding season, to cover feeding operations. The advance this season being 1·275 cents per lb, leaves a balance of $47.59 for lot. As in all other live stock experiments, no charge is made for labour, nor credit given for manure made.

STEER CALF EXPERIMENT.

This experiment which was started in May, 1901, with ten calves, in two lots of five each, to determine the comparative economy of feeding calves a 'full fattening ration' from the start, as contrasted with a 'limited growing ration,' was continued with the five termed Ex. I., Lot II., L.G.R. calves of May, 1901, Lot I. of Ex. I., having been considered finished and sold April 30, 1903. Ex. II. calves of May, 1902, Ex. III. calves of May, 1903, were also continued, while Ex. IV. ten calves of May, 1904, was commenced.

EXPERIMENT I.—LIMITED GROWING RATION. CALVES OF MAY, 1901, CONTINUED FROM DECEMBER 1, 1903.

Lot II.	Daily Ration.	Daily Cost.	Cost for Period.	Total.
Period.		$ cts.	$ cts.	$ cts.
December 1 to December 31	Roots, 90 lbs	0 09	2 70	
	Hay, 8 lbs	0 03$\frac{1}{5}$	0 96	
	Meal, 3 lbs	0 03$\frac{3}{5}$	1 08	4 74
December 31 to January 30	Roots, 90 lbs	0 09	2 70	
	Hay, 8 lbs	0 03$\frac{1}{5}$	0 96	
	Meal, 4 lbs	0 04$\frac{4}{5}$	1 44	5 10
January 30 to March 1	Roots, 60 lbs	0 06	1 80	
	Hay, 8 lbs	0 03$\frac{1}{5}$	0 96	
	Meal, 6 lbs	0 07$\frac{1}{5}$	2 16	4 92
March 1 to March 31	Roots, 40 lbs	0 04	1 20	
	Hay, 10 lbs	0 04	1 20	
	Meal, 8 lbs	0 09$\frac{3}{5}$	2 88	5 28
March 31 to April 30	Roots, 30 lbs	0 03	0 90	
	Hay, 10 lbs	0 04	1 20	
	Meal, 10 lbs	0 12	3 60	5 70
April 30 to May 30	Roots, 20 lbs	0 02	0 60	
	Hay, 12 lbs	0 04$\frac{4}{5}$	1 44	
	Meal, 10 lbs	0 12	3 60	5 64
Cost of feed, 1 steer				31 38
" 5 steers				156 90

Lot II.	Weight at Start.	Weight at Finish.	Gain.
Period.	Lbs.	Lbs.	Lbs.
December 1 to May 30	5,160	6,530	1,370

		Lbs.
Weight of five steers, December 1, 1903		5,160
Weight of five steers, May 30, 1904		6,530
Gain for period		1,370
Daily rate of gain per steer		1·52
Cost of feed per day per steer	$	0 17·43
Cost of 1 lb. gain		0 11·45
Cost of feed for lot, 180 days		156 90
Cost of 1 lb. gain for entire experiment		0 06·15

EXPERIMENT I.—LOT I.—F.F.R. CALVES OF MAY, 1901.

Lot I. finished April 30, 1903, sold and reported page 289 Report of 1903. Inserted for comparison.

SUMMARY OF LOT I.—EXPERIMENT I.

	Lbs.
Weight of five steers, December 1, 1902	4,620
Weight of five steers, April 30, 1903	6,355
Gain for period	1,735
Daily rate of gain per steer	2·32
Cost of feed per day per steer $	0 12·54
Cost of 1 lb. gain	0 06·
Cost of feed for lot, 150 days	104 10
Cost of 1 lb. gain for entire experiment	0 05·53

STEER CALF EXPERIMENT—EXPERIMENT II.

Experiment II. (continued from December 1, 1903.)

The following tables show results to March 30, 1904, and December 1, 1904.

The full fattening ration 'Lot I.' of this experiment were finished and sold March 30, 1904. The limited growing ration Lot II. will be kept until spring of 1905.

EXPERIMENT II.—CALVES OF MAY, 1902. CONTINUED FROM DECEMBER 1, 1903.

Lot I.	Daily Ration.	Daily Cost.	Cost for Period.	Total.
Period.		$ cts.	$ cts.	$ cts.
Dec. 1 to Dec. 31	Roots, 60 lbs	0 06	1 80	
	Hay, 8 lbs	0 03½	0 96	
	Meal, 3 lbs	0 03⅝	1 08	3 84
Dec. 31 to Jan. 30	Roots, 60 lbs	0 06	1 80	
	Hay, 8 lbs	0 03½	0 96	
	Meal, 4 lbs	0 04⅘	1 44	4 20
Jan. 30 to Mar. 1	Roots, 40 lbs	0 04	1 20	
	Hay, 10 lbs	0 04	1 20	
	Meal, 5 lbs	0 06	1 80	4 20
Mar. 1 to Mar. 31	Roots, 30 lbs	0 03	0 90	
	Hay, 10 lbs	0 04	1 20	
	Meal, 6 lbs	0 07½	2 18	4 26
Cost of feed, 1 steer				16 50
" 5 steers				82 50

	Lbs.
Original weight, 5 steers, December 1, 1903	5,220
Weight at finish, 5 steers, March 30, 1904	6,230
Gain for period	1,010
Daily rate of gain per steer lbs.	1·68
Cost of feed per day per steer cts.	13·75
Cost of 1 lb. gain "	8·16
Cost of feed for lot, 120 days $	82 50

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EXPERIMENT II.—CALVES OF MAY, 1902, CONTINUED FROM DECEMBER, 1, 1903.

Lot II.	Daily Ration.	Daily Cost.	Cost for Period.	Total Cost.
Period.		$ cts.	$ cts.	$ cts.
Dec. 1 to Dec. 31	Roots, 40 lbs	0 04	1 20	
	Hay, 4 lbs	0 01$\frac{3}{5}$	0 48	
	Straw, 5 lbs	0 01$\frac{1}{2}$	0 45	2 13
Dec. 31 to Jan. 30	Roots, 40 lbs	0 04	1 20	
	Hay, 4 lbs	0 01$\frac{3}{5}$	0 48	
	Straw, 5 lbs	0 01$\frac{1}{2}$	0 45	2 13
Jan. 30 to March 1	Roots, 40 lbs	0 04	1 20	
	Hay, 8 lbs	0 03$\frac{1}{5}$	0 96	2 16
March 1 to March 31	Roots, 40 lbs	0 04	1 20	
	Hay, 8 lbs	0 03$\frac{1}{5}$	0 96	2 16
March 31 to April 30	Roots, 30 lbs	0 03	0 90	
	Hay, 10	0 04	1 20	2 10
April 30 to May 30	Roots, 20 lbs	0 02	0 60	
	Hay, 12	0 04$\frac{4}{5}$	1 44	2 04
May 30 to Nov. 1	5 months at pasture at			6 00
Nov. 1 to Dec. 1	Roots, 80 lbs	0 08	2 40	
	Hay, 8 lbs	0 03$\frac{1}{5}$	0 96	
	Meal, 3 lbs	0 03$\frac{3}{5}$	1 08	4 44
Cost of feed for 1 steer, 365 days				23 16

STEER CALF EXPERIMENT II.—CONTINUED.

Lot II.	Weight at start.	Weight at finish.	Gain.
Period.	Lbs.	Lbs.	Lbs.
Dec. 1 to June 1	3,690	4,395	705
June 1 to Dec. 1	4,395	5,475	1,080

		Lbs.
Original weight of 5 steers, Dec. 1, 1903		3,690
Weight at finish, of 5 steers, Dec. 1, 1904		5,475
Gain for period		1,785
Daily rate of gain per steer	lbs.	·97
Cost of feed per day per steer (winter)	cts.	8·17
" " " (summer)	"	4·00
" " " for period	"	6·34
Cost of 1 lb. gain	"	6·48
Cost of feed for lot, 1 year		**$115 80**

EXPERIMENT III.—LOT I, FULL FATTENING RATION—CALVES OF MAY, 1903.

Period.	Daily Ration.	Daily Cost.	Cost for Period.	Total.
		$ cts.	$ cts.	$ cts.
Dec. 1 to Dec. 31	Roots, 15 lbs.	0 01½	0 45	
	Hay, 2½ lbs.	0 01	0 30	
	Meal, 2 lbs.	0 02⅖	0 72	1 47
Dec. 31 to Jan. 31	Roots, 20 lbs.	0 02	0 60	
	Hay, 2½ lbs.	0 01	0 30	
	Meal, 2 lbs.	0 02⅖	0 72	1 62
Jan. 31 to March 1	Roots, 25 lbs.	0 02½	0 75	
	Hay, 4 lbs	0 01⅗	0 48	
	Meal, 2 lbs.	0 02⅖	0 72	1 95
Mar. 1 to Mar. 31	Roots, 30 lbs.	0 03	0 90	
	Hay, 4 lbs.	0 01⅗	0 48	
	Meal, 2 lbs.	0 02⅖	0 72	2 10
Mar. 31 to April 30	Roots, 30 lbs.	0 03	0 90	
	Hay, 4 lbs.	0 01⅗	0 48	
	Meal, 2 lbs.	0 02⅖	0 72	2 10
April 30 to May 30	Roots, 30 lbs	0 03	0 90	
	Hay, 4 lbs.	0 01⅗	0 48	
	Meal, 2 lbs.	0 02⅖	0 72	2 10
May 30 to June 30	Roots, 30 lbs.	0 03	0 90	
	Hay, 5 lbs.	0 02	0 60	
	Meal, 2 lbs.	0 02⅖	0 72	2 22
June 30 to July 15	Meal, 2 lbs.	0 02⅖	1 08	
	Pasture at	....	1 50	2 58
July 15 to Oct. 1	Green feed, 40 lbs.	0 04	3 00	
	Meal, 2 lbs.	0 02⅖	1 80	4 80
Oct. 1 to Nov. 1	Pasture at	....	1 00	1 00
Nov. 1 to Dec. 1	Roots, 40 lbs.	0 04	1 20	
	Hay, 5 lbs.	0 02	0 60	
	Meal, 2 lbs.	0 02⅖	0 72	2 52
Cost of feed 1 steer, 365 days	....	....	....	24 46

STEER CALF EXPERIMENT III.—CONTINUED.

Period.	Lot I. Weight at Start.	Weight at Finish.	Gains.
	Lbs.	Lbs.	Lbs.
December 1 to June 1	2,895	3,710	815
June 1 to December 1	3,710	4,820	1,110

	Lbs.
Weight at start, 5 steers, Dec. 1, 1903	2,895
Weight at finish, 5 steers, Dec. 1, 1904	4,820
Gain for period	1,925

Daily rate of gain per steer	lbs.	1·05
Cost of feed per day per steer (winter)	cts.	6·60
Cost of feed per day per steer (summer)	"	6·83
Cost of 1 lb. gain	"	6·35
Cost of feed per day per steer for period	"	6·70
Cost of 1 lb. gain	"	6·35
Cost of feed for lot, 1 year		$122 30

Steer Calf Experiment IV.

In estimating the cost of feeding calves, the following values were put on the different feeds :—

New milk, $1 per 100 pounds.
Skim milk, 15 cents per 100 pounds.
Meal (oats, wheat, bran and oil cake), $1 per 100 lbs.
Roots or ensilage, 10 cents per 100 lbs.
Hay, $8 per ton.

Experiment IV.—Lot I. full fattening ration—calves of May, 1904.

Period.	Daily Ration.	Amount fed during Period.	Cost.	Total Cost.
		Lbs.	$ cts.	$ cts.
June 1 to July 1	10 lbs. whole milk	1,500	15 00	
	10 lbs. skim-milk	1,500	2 25	
	¼ lb. meal	37½	0 37½	
				17 62½
July 1 to August 1	10 lbs. whole milk	1,550	15 50	
	10 lbs. skim-milk	1,550	2 32	
	½ lb. meal	77½	0 77½	
				18 59½
August 1 to September 1	20 lbs. skim-milk	3,100	4 65	
	2 lbs. hay	310	1 24	
	1 lb. meal	155	1 55	
				7 44
September 1 to October 1	10 lbs. skim-milk	1,500	2 25	
	2 lbs. hay	300	1 20	
	1 lb. meal	150	1 50	
				4 95
October 1 to November 1	10 lbs. roots	1,550	1 55	
	2 lbs. hay	310	1 24	
	1½ lbs. meal	232	2 32	
				5 11
November 1 to December 1	10 lbs. roots	1,500	1 50	
	2 lbs. hay	300	1 20	
	2 lbs. meal	300	3 00	
				5 70
Cost of feed, 5 calves 180 days				59 42

	Lbs.
Weight of 5 calves, June 1, 1904	905
Weight of 5 calves, Dec. 1, 1904	2,650
Gain for period	1,745

Daily rate of gain per steer	lbs.	1·90
Cost of 1 lb. of gain	cts.	3·40
Cost of feed per day	"	6·49
Cost of feed for lot, 183 days		$59 41

STEER CALF EXPERIMENT IV.—LOT II. LIMITED GROWING RATION CALVES OF MAY, 1904.

Period.	Daily Rations.	Amount fed during Period.	Cost.	Total Cost.
		Lbs.	$ cts.	$ cts.
June 1 to July 1	10 lbs. whole milk	1,500	15 00	
	10 lbs. skim-milk	1,500	2 25	
	¼ lb. meal	37½	0 37½	
				17 62½
July 1 to August 1	5 lbs. whole milk	775	7 75	
	15 lbs. skim-milk	2,325	3 49	
	¼ lb. meal	38¾	0 38¾	
				11 63¾
August 1 to September 1	20 lbs. skim-milk	3,100	4 65	
	2 lbs. hay	310	1 24	
	¼ lb. meal	38¾	0 38¾	
				6 27¾
September 1 to October 1	10 lbs. skim-milk	1,500	2 25	
	2 lbs. hay	300	1 20	
	½ lb. meal	75	0 75	
				4 20
October 1 to November 1	10 lbs. roots	1,550	1 55	
	2 lbs. hay	310	1 24	
	½ lb. meal	77½	0 77½	
				3 56½
November 1 to December 1	20 lbs. roots	3,000	3 00	
	2 lbs. hay	300	1 20	
	½ lb. meal	75	0 75	
				4 95
Cost of feed, 5 steers, 183 days				48 24

		Lbs.
Weight of 5 calves, June 1, 1904		650
Weight of 5 calves, Dec. 1, 1904		2,015
Gain for period		1,365
Daily rate of gain per calf	lbs.	1·51
Cost of 1 lb. gain	cts.	3·53
Cost of feed per day per calf	"	5·27
Cost of feed for period, 5 calves		$48 24

PIGS.

The herd of pigs on the farm consists of Yorkshires, Berkshires and their grades and crosses, in all 70 head, as follows :—

1 Yorkshire boar.
3 Yorkshire sows.
2 Berkshire sows.
4 Grade-York sows.
20 Grade pigs, 6 months old.
40 Grade pigs, 1 to 2 months old.

EXPERIMENTS WITH SWINE.

Feeding in pasture as compared with feeding in pens.

This experiment, carried on in the summers of 1902-03, was repeated this year with 20 pigs of one month old, in two lots of 10 each, of various breeds and crosses, each lot consisting of an equal number from each litter and termed lot I. and lot II.—lot I. in pasture and lot II. in pens.

Lot I. were fed an average daily ration of 2 lbs. meal, largely shorts, and 5 lbs. skim-milk, from July 1 to November 1, and pasture, which consisted of clover, rape, hairy or sand vetch, and spring vetch and peas mixed sown on different parts of a field of one acre in extent.

Lot II. were fed the same daily ration in pens.

A portable house was used for shelter.

On November 1 the pigs were taken into pens, and fed a ration of 3 lbs. meal until December 1.

The results are as follows :—

Experiments with Swine—Experiment I.

LOT I. FED ON PASTURE, JULY 1 TO NOVEMBER 1; FED IN PENS, NOVEMBER 1 TO DECEMBER 1.

Period.	Weight at Start.	Weight at Finish.	Gain.
	Lbs.	Lbs.	Lbs.
July 1 to November 1	170	1,129	959
November 1 to December 1	1,129	1,609	480
Total gain, 10 pigs, 153 days	....	....	1,439

	Lbs.
Average daily gain on pasture, July 1 to November 1..	·78
Average daily gain in pens, Nov. 1 to Dec. 1..	1·60
Cost per pound gain, entire period. . . . . .cts.	3·55

LOT II. FED IN PENS, JULY 1 TO DECEMBER 1, 1904.

Period.	Weight at Start.	Weight at Finish.	Gain.
	Lbs.	Lbs.	Lbs.
July 1 to March 1	185	1,169	984
November 1 to December 1	1,169	1,472	303
Total gain, 10 pigs, 153 days	....	....	1,287

	Lbs.
Average daily gain in pens, July 1 to November 1.. . .	·80
Average daily gain in pens, Nov. 1 to Dec. 1..	1·01
Cost per pound gain, entire period.. .. ..cts.	3·94

SHEEP.

The flock of sheep at present consists of:—

1 pure bred Leicester ram.
3 " " ewes.
5 " Shropshire ewes.
4 grade ewes.
2 Shropshire ewe lambs.
3 Leicester ewe lambs.
1 Leicester ram lamb.
1 grade wether lamb.

POULTRY.

During the year, six breeds of poultry were kept: B. P. Rocks, W. Leghorns, Black Minorcas, W. Wyandottes, Buff Wyandottes and Silver Grey Dorkings.

The breeding pens were made up as follows:—

	Hens	Cocks.
B. Plymouth Rocks	14	1
Black Minorcas	5	1
White Leghorns	4	1
White Wyandottes	5	1
Buff Wyandottes	3	1
Silver Grey Dorkings	2	1

The season's chicks were all hatched by incubators, the incubators being filled five times, with very unsatisfactory results. Partly owing to infertile eggs and weak germs, numerous fully developed chicks died in the shell at pipping stage, and those hatched were not as strong and vigorous as in former years.

The hens were apparently in good condition. So far, we have been unable to locate the trouble satisfactorily.

The eggs laid by the different breeds were as follows.

	Eggs laid	Av. per hen
14 B. P. Rocks	686	49
5 Black Minorcas	200	40
4 White Leghorns	200	50
5 White Wyandottes	245	49
3 Buff Wyandottes	141	47
2 Silver Grey Dorkings	90	45

CORRESPONDENCE.

During the year, 2,030 letters were received, and 1,790 sent out, exclusive of circulars sent out with grain distribution, reports, &c.

EXHIBITIONS, AGRICULTURAL MEETINGS AND EXCURSIONS TO THE FARM.

An exhibit was made of farm produce at the Nova Scotia provincial exhibition, Halifax, N.S., September 7 to 14; the New Brunswick provincial exhibition, St. John, N.B., September 16 to 24, and at the Prince Edward Island provincial exhibition, Charlottetown, P.E.I., September 27 to 30.

I addressed agricultural meetings during the year at West River, Pictou County, N.S.; Truro, N.S.; Fredericton, N.B.; Woodstock, N.B.; Chatham, N.B.; Pugwash, N.S.; Windsor, N.S.; Barronsfield, N.S.; River Hebert, N.S.; Greenville, N.S.; Wallace Bridge, N.S.; Upper Stewiacke, N.S.; Middle Stewiacke, N.S.; Brookfield, N.S., and Antigonish, N.S. I also delivered a series of lectures to the students of the Sussex, N.B. Dairy School in March. I also attended the Dominion Live Stock Convention at Ottawa, and the Maritime provincial exhibitions.

As usual many visitors have been on the farm this year and there have been several farmers' excursions, the largest of which was that of the Pictou County Farmers' Association on July 13, when over 1,000 were present. Small excursions from surrounding districts were frequently made to the farm.

I have the honour to be, sir,

Your obedient servant,

R. ROBERTSON,

Superintendent.

REPORT OF THE HORTICULTURIST.

(W. S. BLAIR.)

NAPPAN, N.S., December 1, 1904.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith a report of some of the work done in the horticultural department of the Experimental Farm for the maritime provinces during the year 1904.

The winter of 1903-4 was a severe one, and the temperature was not so variable as usual. The fruit and ornamental trees and shrubs, however, came through the winter in excellent condition and did not suffer more from winter injury than usual.

The spring was later at the start than usual, but toward the last of May favourable warm weather forced along vegetation, and by the middle of June the season was as far advanced as it generally is at that date.

The mean average temperature for May was 4° warmer than the average for the past four years. June was warmer than the same month in 1903 by over 2°. July was also much warmer than usual, being about 5° in the mean average above the same month in 1903. The balance of the season averaged about the same as usual. The following table gives the mean average temperature for the months of May, June, July, August and September, as compared with the same months during the past four years :—

Month.	Mean Temperature at Nappan.					Rainfall.	
	1904.	1903.	1902.	1901.	1900.	1904.	1903.
	°	°	°	°	°	In.	In.
May	51·7	47·7	47·6	48·1	46·1	1·76	0·68
June	55·9	53·6	54·5	59·3	57·	1·74	2·29
July	67·0	62·7	61·7	65·2	64·5	2·15	2·07
August	61·5	59·3	63·4	65·3	62·1	3·51	2·40
September	53 6	57·5	57·5	58·4	53·4	4·52	3·63

The season was exceptionally favourable for plants that require a fair amount of heat, such as tomatoes, squash and beans, all of which ripened up better than usual. This summer again was too dry for most farm crops, and many of the garden crops suffered greatly; especially was this the case with annual flowering plants. Never before has the lawn appeared so burnt and dried up as it was this summer. Where fruit trees were kept in a good state of cultivation they suffered little for want of moisture; but, generally speaking, the fruit was smaller than it would probably have been had the moisture conditions been more favourable. This was especially apparent in uncultivated orchards.

There were two frosts in June; one on the 9th of 1°, and one on the 10th of 2°, which did considerable damage to tomatoes, squash and tender annuals that were not covered. Fortunately the most of these were covered, as indications favoured a frost at this time. The only frosts recorded in May were on the 1st, 2nd, 6th and 7th of 1°, 5°, 6° and 5°, respectively. The first fall frost, September 1, of 1°, was earlier this season than usual, but light, doing slight damage. One on the 23rd of 9°, and one on the 28th of 2°, killed all tender plants.

The apple crop here this year was larger than usual. The capacity of the trees for producing is gradually increasing. Some of the varieties produce small unsaleable apples, and some are varieties of inferior quality which are hard to dispose of when such sorts as Gravenstein and Bishop Pippin are on the market in quantity at low prices, as was the case this season. Consequently the revenue from this source is not as high as anticipated. Heavy winds during the latter part of August and early September shook off a considerable quantity of fruit.

Two trees of Gravenstein were lost from the disease known as collar rot. This is a rotting of the bark at the surface of the ground. These trees were in a vigorous state until last season, when they appeared to lack vigour, and although the affected portions were removed, and the wounds well washed with a copper sulphate solution, they died during the winter, which was no doubt partly due to the severe season. One Banks or Red Gravenstein also winter root-killed. This tree had not previously been in a very vigorous state, although the bark appeared healthy. This tree was planted where there was heavy clay near the surface, which was probably the cause of its unthrifty condition. Four trees were injured by sunscalding above the veneering used for protection in the orchard, and had to be removed. In the orchard, protected by a shelter belt of natural spruce, two trees were injured by mice girdling below the veneering, which was not set down close enough to the ground. Mice were very numerous in the protected orchard, which was no doubt largely due to strips of land between the trees being previously in clover. No mice were noticed in the other orchard, where the whole ground was more or less in cultivated crops. Numerous complaints were received from different parts of the provinces of the damage done by mice. A good protection for trees against their attack is strips of veneering (thin hardwood) about 2 feet long wrapped around the trunk of the tree and tied with binder twine or some such strong twine. This veneering can be kept from year to year and made to serve for a number of years. This is also valuable for protecting trees from sunscald.

There was very little apple spot on the fruit this year, and very few apple worms. The apple and plum aphis were more numerous than usual, and were controlled by a spray of whale oil soap and water; 1 lb. soap to 6 gallons of water.

The plum crop was small, which was doubtless largely due to the severe winter. The pear crop was a failure, only the Flemish Beauty producing fruit. The crop of cherries was also small, and, as usual, the birds took the most of the fruit. From our experience it would appear that we cannot grow the sweet cherries here successfully. The common cherry of the country, of Richmond type, found growing in every section of the country, seems adapted to a larger range of conditions than any others. Seedlings of these start up under old trees and if set out and cultivated have given better satisfaction than any of the newer varieties. In some more suitable locations this may not hold good; but, generally speaking from a maritime standpoint, this is the case.

The strawberry plantation was on a piece of heavy soil on which ice formed during the winter, and the crowns of the plants were injured. When the mulch was removed it was found that the majority of the plots were killed out completely. Of the remaining plants the crop was light owing to the dry weather. The crop of gooseberries was fair. The English varieties were badly covered with mildew, rendering them largely unmarketable. They were sprayed several times with potassium sulphide, 1 oz. to 2 galls. water, which only partially controlled this fungus. The currants were a fair crop. Raspberries a light crop.

The fruit and ornamental trees and shrubs have made a fair growth of wood during the season which seems to have ripened up well. The perennial flowering plants did well, and some additional Japanese Irises were planted. In this report a list of some of the best perennials tested during the past four years, is given. There is also given in this report the results of some experiments conducted to find out the moisture contents of soil treated in different ways. Tests, as usual, have been carried on with different varieties of vegetables, some of which are given herewith. Some experiments were also tried, conducted with materials recommended for the destruction of root maggots and cutworms. The results also of some experiments with cover crops grown in the orchard here are included.

I beg to acknowledge the following donations:—From Prof. Sears, Director School of Horticulture, Wolfville, N.S., scions of 'Red Russet' apple. From Mr. Whitman Ruggles, Nictaux, N.S., scions of 'Red Russet' apple. From Mr. A. C. Starr, Starr's Point, N.S., scions of 'Bosc' pear and 'Winterstein' apple. From Mr. Wm. Bustin, Belleisle, Granville, Annapolis Co., N.S., scions of 'Ribston Pippin' apple. From Mr. James Bonneyman, New Annan, N.S., scions of 'Rhymer Pippin apple. From Mr. John Robertson, 'Inkerman Farm,' New Perth, P.E.I., seedling apple stocks for root grafting. From Mr. Henry Piers, North-west Arm, N.S., seeds of 'Asparagus' pole beans. From D. J. Stewart, Lower Montague, P.E.I., plants of 'Cyclone,' 'Hunn' and 'Excelsior' strawberries.

I also addressed several agricultural meetings in each of the three maritime provinces during the year.

PERENNIALS.

Many different kinds of herbaceous perennials have been tested in the perennial border during the past four years. The following is a list of some of those which have done the best:—

Anemone narcissiflora.—Wind flower. Height 8 to 10 inches. Pretty white flowers. 1 to 1½ inches across. In bloom from the last of May to the last of July.

Arabis alpina.—White Alysssum. Height 6 inches. An abundance of small white flowers borne profusely over the whole plant. In bloom the 10th of May.

Aster Novæ Angliæ roseus.—Pink-flowered New England aster. Height 3 feet. In bloom the last of August. A showy perennial flowering profusely in clusters of bright pink.

Aconitum napellus.—Common monk's hood or helmet flower. Height 4½ feet. Comes into bloom soon after the middle of July. The flowers are blue, borne on large terminal spikes.

Aconitum napellus album.—Similar to the above, except that the flowers are nearly white. These two plants are very desirable for rear border planting.

Achillea ptarmica flore pleno.—Double sneezewort. Height 2 feet. Flowers small, white, round, compact, borne in loose clusters. In bloom from the middle of June to the last of August. One of the finest white flowering perennials for cutting.

Aquilegia chrysantha.—Golden spurred columbine. Height 2½ feet. Large, bright yellow flowers. In bloom the first of July.

Aquilegia oxysepala.—Russian colombine. Height 1 foot. In bloom the last of May. Flowers large purplish-blue. A very desirable early flowering perennial.

Boltonia latisquama.—Height 5 feet. White flowers, somewhat resembling the wild aster, borne profusely in large panicles. In bloom the middle of August. One of the best tall late flowering perennials.

Boltonia asteroides.—False chamomile. Height 4½ feet. Small pale pink flowers similar to the above. A profuse bloomer after the last of August. A showy late perennial that will stand wind without staking.

Campanula persicifolia.—Peach-leaved bellflower. Height 2 feet. Large blue flowers borne in a raceme with long flower stems. . In bloom during the month of July.

Campanula persicifolia grandiflora alba.—Double white bellflower. This is one of the best campanulas grown here. Large white double flowers. Height 2 feet. In bloom during July.

Clematis recta.—Erect Virgins Bower. Height 4 feet. In bloom during July. The flowers are white, small, borne profusely in dense clusters. Valuable for back of perennial border. Much admired.

Convallaria majalis.—Lily of the Valley. In bloom the first week in June. The plants do best in a shaded place. The bloom of this well known flower has in the past been injured greatly by our early June frosts.

Coreopsis delphinifolia.—Larkspur-leaved tick-seed. Height 2½ feet. Showy yellow flower with dark centre. In bloom July 20 to the last of August. One of the best perennials.

Delphinium cashmerianum.—Cashmerian larkspur. Height 18 inches. Flowers in different shades of blue; borne in large open heads. In bloom from the middle of July to the last of August.

Dicentra spectabilis.—Bleeding heart. Height 2½ feet. Red and white heart-shaped flowers, borne in pendulous racemes.

Doronicum plantagineum excelsum.—Tall plantain-like leopard's bane. Height 18 inches. In bloom the first of June. Large yellow flowers on long stems. Liked for cutting. One of the best.

Doronicum caucasicum.—Caucasian leopard's bane. Height 12 inches. Yellow flower similar to the above, but smaller. In bloom May 25 to June 18. These are two of the most desirable and showy spring flowering perennials.

Erigeron macranthus.—Fleabane. Height 18 inches. Flowers heliotrope, rays with yellow centres. In bloom during July. A much admired perennial.

Funkia sieboldiana.—Large-flowered plantain lily. Height 15 inches. Flowers pale blue, borne in racemes. In bloom July 18. This with its regular plantain-like leaves overlapping each other makes an interesting plant.

Gypsophila paniculata.—Infant's breath. Height 2½ feet. Small white flowers, borne profusely in large open panicles. In bloom from the last of July to September. Much liked for cutting.

Gaillardia aristata grandiflora.—Large flowered blanket flower. Height 18 inches. Flowers borne singly on long stems, yellow, with deep orange centres. In bloom during July and August. Very useful for cutting.

Helenium grandicephalum striatum.—Large striped Sneezewort. Height 3½ feet. Flowers yellow, with brown markings. A striking perennial in bloom from early August to October.

Helenium autumnale.—Autumn flowering Sneezewort. Height 4 feet. Large yellow flowers. Very showy. In bloom the last of July to the last of September.

Helianthus maximiliana.—Perennial sunflower. Height 4 feet. Flowers large yellow. Very showy. In bloom early in August.

Hemerocallis flava.—Yellow day lily. Height 2 feet. Flowers fragrant, orange yellow. In bloom after July 1. This is one of the best day lilies.

Iris pumila.—Dwarf Iris. Height 5 inches. In bloom the last of May. Flowers purple.

Iris Sibirica.—Siberian Iris. Height 3 feet. Flowers white and blue. Small, on long stems. In bloom the middle of June. Not so attractive as some other forms of Iris.

Iris Germanica.—German Iris. Height 2 feet. In bloom from the middle to the last of June. Flowers large, ranging in colours of lilac, blue and purple. Slightly fragrant. One of the most desirable groups of irises of which there are many good varieties. Purple King is an especially striking one.

Iris florentina.—Orris root. Height 2 feet. Flowers pale lilac blue, shading to white. Large flowers, sweet scented, on long stalks. A good one. In bloom from the middle to last of June.

Iris flavescens.—Height 2 feet. Flowers lemon yellow, with purplish brown markings. In bloom at the same time as the above.

Iris variegata.—Height 1½ to 2 feet. Flowers large, much veined with brown on a yellow ground. The variety Honorabile is a good one of this group.

Iris Amœna.—Height 18 inches. In bloom second and third week in June. Flowers almost white or lilac-tinted outer segments and purple or purple-tinted centre. This has a variety of markings. Mrs. H. Darwin, an almost pure white variety of this group, is also very fine.

Iris plicata.—Fringed Iris. Height 18 inches. Flowers white in centre of outer segments; veined with lilac toward the margin; inner segments white tinted with lilac or blue. Madame Chereau is a fine variety of this group.

Iris kaempferi.—Japanese Iris. Height 18 inches. In bloom soon after the middle of July. The flowers are very large, with various combinations of colours. A very desirable late flowering plant of which there are a great number of varieties.

Lilium auratum.—Golden-rayed lily of Japan. Height 3 feet. In bloom the second week in June. Flowers large, white petals, spotted with red and purple, and golden centre. Very desirable.

Lilium tenuifolium.—Narrow-leaved Siberian lily. In bloom the first of July. Height 2 feet. Flowers bright scarlet drooping. A very attractive little lily.

Lilium tigrinum.—Common tiger lily. Height 2½ feet. Flowers deep orange, large petals, spotted with many purplish black dots. In bloom the first of July.

Lilium superbum.—Superb lily. Height 4½ feet. Flowers orange red spotted with dark brown. Very showy.

Lilium candidum.—Madonna lily. Flowers large, pure white, fragrnt; one of the best for general cultivation. Height, 2 feet. In bloom early in July.

Lilium speciosum.—Showy Japanese lily. Height, 2½ feet. In bloom the middle of July. Flowers white, more or less tinged with pink and doted with red; a very fine lily, of which there are several varieties.

Paeonia officinalis, and *Paeonia sinensis.*—The common and Chinese pæonys are in bloom during the greater part of July. There are a great number of varieties, some of which should be included in every garden.

Papaver orientale.—Oriental poppy. Height 2 feet. In bloom the last of June. Flowers very large; a blaze of scarlet.

Papaver nudicaule.—Iceland poppy. Height 1 foot. In bloom the middle of May and continues through the summer. Flowers orange, white or yellow. Very desirable.

Phlox subulata lilacina.—Moss pink. A profuse bloomer from about May 24 to the middle of June. Low matted growth. Flowers light blue. Very desirable.

Phlox amoena.—Lovely Phlox. In bloom about the same time as the above. Flowers bright pink. Low matted growth of 4 to 6 inches. Very desirable.

Phlox decussata.—Hybrid perennial phlox. Height 1½ to 3 feet. In bloom during August and September. The many varieties of this beautiful plant show some superb markings in many shades and colours.

Rudbeckia laciniata.—Golden Glow. Height, 5 to 6 feet. Flowers large; bright yellow, double. This is a profuse bloomer during August, and is one of the most desirable tall-growing perennials.

Rudbeckia maxima.—Great cone flower. Height 5 to 6 feet. In bloom during August. Flowers yellow, with a long cone-shaped centre.

Pyrethrum uliginosium.—Great Ox-eye. Height 3½ feet. Flowers white with yellow centre. In bloom after the last of August.

Spiræa filipendula.—Dropwort. Height 2 feet. In bloom from the first to after the middle of July. A profuse bloomer; flowers white, borne in loose panicles.

Spiræa ulmaria.—Meadow sweet. Height 3½ feet. In bloom after the middle of July. Flower heads present a feathery appearance, having numerous cream-coloured flowers borne in large compound heads.

Spiræa filipendula, flore pleno.—Double-flowered Dropwort. Similar to the first-named spiræa, with double pure white flowers. Much admired.

Spiræa palmata elegans.—Japanese spiræa. Height 2 feet. In bloom during July. Flowers white, with crimson anthers, borne in panicles. A very desirable perennial.

Spiræa venusta.—Queen of the Prairie. Height 2½ feet. In bloom during the last of July and early August. Flowers pink, small, profusely borne in large panicles. A much desired pink spiræa.

Thalictrum aquilegifolium.—Columbine rue. Height 3½ to 4 feet. In bloom the middle of July. Flowers small, white, numerous, borne in loose panicles. A desirable sort.

COVER CROPS.

Cover crops of different kinds have been grown in the orchard here for a number of years. The primary object in growing such a crop in the orchard is to form a cover of vegetation that will serve as a protection to the roots of the trees during winter. Such a crop, however, is also of value from the fact that plant food not required by the fruit tree during the fall, and which is liable to be leached away by late fall or early spring rains, is taken up and held in a convenient form to turn under the following spring; adding, also, humus to the soil by which it is so greatly improved.

In growing cover crops, the aim is to get a fairly thick mat of vegetation, and also a mat that can conveniently be turned under the following spring. It is also advisable to grow one of those crops known as legumes, which enrich the soil by the addition of nitrogen assimilated from the air by means of bacteria on their roots. Common and generally available among these for cover crop purposes are the pea, vetch and clover.

It is very important that an orchard should be worked as soon in the spring as the ground is fit and kept in a good loose condition by frequent cultivation until the middle of July. This practice not only stimulates early active vegetation, but also conserves moisture. Moisture is generally abundantly supplied by frequent rains after this date and the ground can safely be put into a cover crop any time between the middle of July and August. Cover crops should not be sown later than the first of August to get a good mat of growth for winter protection. In 1903 the cover crops were sown July 29, and this season they were sown July 26. The following table gives notes taken upon their growth in 1903, and concerning the ease with which they were turned under in the spring :—

Cover Crop Sown.	Quantity of Seed sown per Acre.	Height of Growth, Oct. 31, 1903.	Character of Cover, Nov. 30, 1903.	Ease with which they were ploughed under, May 10, 1904.
	Bush.			
Peas.	3	Growth of vine, 40 in.	Thick mat 3 to 5 in. deep, good cover.	Very difficult to get well turned under.
Oats	4	" straw, 30 in.	Thick mat 4 to 6 in. deep, good cover.	Very difficult to get well turned under.
Winter Rye	3½	5 inches	Fairly thick mat 5 to 6 inches, ground almost covered.	Easily ploughed under and worked.
Buckwheat	3	30 "	Thin covering 3 to 4 in. deep; leaves all gone, stalks only remaining.	Difficult to plough under; stalks gather ahead of the plough.
	Lbs.			
Sand Vetch	40	6 to 8 inches	Thick covering 2 to 3 in. deep.	Quite easily turned under.
Mammoth Red Clover.	14	2 to 3 "	Thin mat, scarcely covered ground, 1 in. deep.	Easily ploughed under.
Crimson Clover	20	5 to 8 "	Thick mat 4 to 6 in. deep, covers ground well.	Easily turned under.

The experience gained here seems to indicate that Crimson clover is one of the best cover crops for use in orchards. It produces a good thick mat of nitrogenous material easily turned under and out of the way for future cultivation. Crimson clover is an annual, and only odd plants will stand the winter. The killing of the clover in the winter, however, is not considered a disadvantage because the ground is worked as soon as it is fit.

The cost of these different seeds per acre for sowing to cover crop, is as follows:—

3 bush. pease at 80 cents per bushel	$2 40
4 " oats at 40 cents per bushel	1 60
3½ " winter rye at 60 cents per bushel	2 10
3 " buckwheat at 50 cents per bushel	1 50
40 pounds sand vetch at 9 cents per pound	3 60
14 " mam. red clover at 14 cents per pound	1 96
20 " crimson clover at 8 cents per pound	1 60

SOIL MOISTURE EXPERIMENTS.

The object of these experiments was to obtain information relative to the moisture contents of soil when growing grain or grass crops as compared with that given clean cultivation from early spring until time for sowing a cover crop. The reason for obtaining this information was to see whether fruit trees growing in soil cropped with grain or grasses had sufficient moisture to make proper growth of wood and fruit during this part of the season.

Fruit trees make their wood growth during the first half of the season; consequently any check to this growth during June and July, should, if at all possible, be prevented, especially for young trees. Grasses and grain crops make their growth principally during the first part of the summer and require large quantities of water for their full development. After this water has been taken up by the roots and performed its function in plant growth it is transpired from the leaves in the form of vapour. This taking up of the soil moisture would probably, if the rainfall during the season were light, provided these crops are grown within the root area of the tree, deprive the tree of the necessary moisture for proper growth.

The soil of these plots was of as uniform a character as could be had, a clay loam with a heavy clay subsoil, and underdrained. plots were 36 feet wide and 250 feet long. The samples, however, were taken from plots each 36 x 36 feet; the plots adjoining each other. The soil was taken up by means of galvanized iron cylinders, which were 14 inches long. These were driven into the ground and the column of soil to that depth obtained for each set of samples. Two canisters of soil were taken from a plot at each date, and each canister was taken at a different place in the plot. The places where samples were taken from were marked, and future samples, in case the moisture contents would be affected thereby, were taken sufficiently far from these to represent fairly accurately the percentage of moisture in each plot. The soil samples were sent to Ottawa in air-tight cans to prevent any loss of moisture.

I am indebted to the Chemist of the Experimental Farms, Mr. F. T. Shutt, for the data in the following table, giving the percentage of moisture in the samples of soil from these plots which were sent to him every two weeks during the season.

PERCENTAGE of Moisture in soil of plots sent from the Experimental Farm, Nappan, N.S.

Date when Samples were taken.	Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.	Plot No. 4 *a*.	Plot No. 5.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
May 12	18·41	20·00	18·09	20·88	....	18·93
" 26	17·21	18·02	18·43	21·21	22·42	18·97
June 9	12·52	17·84	19·24	20·31	17·50	14·04
" 23	10·46	17·40	17·71	20·46	19·78	11·65
July 7	9·06	16·70	17·46	19·14	19·13	11·22
" 21	7·46	13·43	16·35	20·54	17·50	12·06
Aug. 4	8·23	9·49	15·10	18·11	17·74	10·36
" 18	9·80	10·30	15·71	20·26	21·04	13·66
Sept. 6	17·79	16·99	20·13	24·04	24·02	20·22
" 20	14·91	16·31	17·99	18·09	18·57	19·87
Oct. 31	21·33	19·77	21·42	26·02	26·53	19·71

HOW PLOTS WERE TREATED.

Plot No. 1.—Plot No. 1 was in potatoes in 1903, and was seeded to winter rye September 21, 1903. The rye was sown at the rate of two bushels per acre, together with Red clover at the rate of 10 pounds per acre. The rye made strong growth of about 50 inches and was harvested August 3. The clover sown with it made very poor growth.

Plot No. 2.—This ground was given clean cultivation during the spring and early summer of 1903, and was seeded to Crimson clover at the rate of 20 pounds per acre July 27, 1903. The clover made a strong growth of from five to seven inches, which in the following spring was practically all dead. The ground was ploughed May 26 to a depth of five inches, and on the 29th was worked up with the disc and springtooth harrows. It was again worked June 13 and 20, once each with the springtooth and smoothing harrows. On June 20 it was seeded to oats at the rate of three bushels of seed per acre.

Plot No. 3.—This plot was in Crimson clover the previous season and had been treated in a similar manner to plot 2. The ground was ploughed this spring as soon as fit, May 13, and harrowed once each with the disc and springtooth harrows on May 29. It was again worked in the same manner on June 20 and 29 and July 7. On July 7 this ground was worked up also with the spade harrow. Alfalfa clover was then sown at the rate of 25 lbs. per acre, drilled in with the grain seed drill. The Alfalfa started quickly and made strong growth, attaining an average height of 12 inches.

Plot No. 4.—This ground was treated similar to plots Nos. 2 and 3 during the season of 1903. The ground was ploughed as soon as fit on May 13 and worked up with disc and springtooth harrows. The land was again worked once each with the disc and springtooth harrows on May 29, June 20 and 29, and on July 7, 13 and 25. On July 25 Crimson clover at the rate of 20 lbs. per acre was sown broadcast and harrowed in lightly with the smoothing harrow. This clover started well and made strong growth, giving a thick mat from 5 to 7 inches deep..

Plot No. 5.—This plot was worked up in the spring of 1903 and seeded to oats June 24 at the rate of three bushels per acre, with 5 lbs. Mammoth Red clover, 3 lbs. Alsike and 12 lbs. Timothy per acre. The growth of grain was good and was used for green feed early in September. The catch of clover was good. The growth of clover this season was strong and was cut for green feed June 23, when about two feet high. A second growth of clover started up and quite a growth of Timothy also appeared. The second growth made quite a mat of from 4 to 7 inches, which still remains.

WINTER RYE.

Plot No. 1.—Winter rye is not generally grown here, but was selected for one plot principally to show the drying effect of grain crops on soil. This plot, as compared with the clean cultivated plot, shows a marked difference in percentage of moisture, especially during June, July and August. The rye crop had ceased to grow by August 1, but not until the heavy rain on August 21 did this ground which had been so thoroughly dried out by the rye become sufficiently moist to admit of growth of the clover sown with the rye. It will be seen by referring to the following table that from July 23 to August 21, 2·28 inches of rain fell, yet the ground remained practically the same in moisture content. A thoroughly dried soil does not absorb water quickly, and drying weather generally prevailing at this time of the year quickly evaporates the water from the top soil before it penetrates to much depth. This shows that ground that has been dried out by such crops require very heavy rains to wet it to a sufficient depth for the moisture to be available for the fruit tree. One inch of rain will make the surface of such a piece of land quite wet, but, still not supply the tree with required moisture. When the soil samples were taken August 4, the surface of the plot was quite damp but the soil below was still thoroughly dried out and did not become moist until after the rainfall on September 3 and 4.

Plot No. 2 was ploughed two weeks later than plot No. 3,, to determine the effect if any of inverting the top soil by ploughing to check the capillary flow of soil water. A reference to the results obtained will show that there was little difference in the percentage of moisture in these two plots up to July 9. It will also be seen that these plots both had a Crimson clover cover crop in 1903 which died during the winter and left a dead mat, which acted as a mulch preventing No. 2 plot from drying out as much as it actually would have done had this decaying mass not been there. The intention was to sow No. 2 and No. 3 plots to oats after working the land on the last of May, and by taking samples from each throughout the season determine what effect early working of the land had in checking the escape of moisture from the land and holding it for the use of the crop later on; but, owing to circumstances unavoidable grain was not sown until June 20. Plot No. 2 was seeded to oats June 20, and plot No. 3 was seeded to Alfalfa on July 7.

Plot No. 4 was given clean cultivation to July 25. The data in the column marked 4*a* represent the moisture in the soil to a depth of only 5 inches. The object was to see how the top 5 inches of soil compared in moisture content with that to a depth of 14 inches.

Plot No. 5, it will be seen, was next to plot 4. Quite a striking difference in percentage of moisture between these two plots is shown.

The following table gives the rainfall and the date on which the rains occurred from March 31 to December 1, 1904:—

RAINFALL, 1904.

April.		May.		June.		July.		August.		September.		October.		November.	
Date.	Ins.	Date.	Ins.	Date.	Ins.	Date.	Ins.	Date.	Ins.	Date.	Ins.	Date.	Ins.	Date.	Ins.
9	·28	10	·17	3	·07	1	·24	1	·13	1	·08	6	·23	4	·77
10	·39	17	·29	5	·74	3	·46	11	·63	3 & 4	1·24	10	·06	6	·07
12	·26	19	·93	7	·07	5	·07	15	·23	6	·66	11	·23	14	1·23
16	·11	21	·05	12	·10	8	·03	17	·29	8	·04	13	·97	18	·47
19	·94	24	·10	18	·04	13	·40	18	·08	12	·26	15	·08	24	·68
21	·26	25	·13	22	·46	20	·03	21	1·70	15	·30	22	2·98	29	·17
29	·16	27	·03	25	·12	23	·69	23	·43	21	·23	26	·18	....	....
30	·52	30	·06	30	·14	29	·23	25	·02	25 & 26	1·20	3	·27	....	....
....	....	....	....	....	....	....	....	....	....	29	·15	....	....	....	....
....	....	....	....	....	....	....	....	....	....	30	·36	....	....	....	....
Total.	2·92	..	1·76	..	1·74	..	2·15	..	3·51	..	4·52	..	5·00	..	3·39
The total Rainfall for the same period in 1903 was :—															
..	3·57	..	0·68	..	2·29	..	2·07	..	2·40	..	3·63	..	5·78	..	7.98

CABBAGE ROOT MAGGOT.

The Cabbage Root Maggot has given considerable trouble during the past few years, but this season they were much more numerous than usual, and proved very destructive to all the plots of cabbage and cauliflowers, except two plots where hellebore was used. An examination of the cabbage plots early in June showed that many eggs were being deposited near the surface of the ground at the base of the plant. Experiments were tried with various mixtures to determine their effect in controlling this pest. Accordingly nine plots were staked off containing 100 plants each. These plants were in a fairly vigorous state, having been set early in May. The plots were treated with the following mixtures:—

No. 1.—Hellebore 2 oz. to 1 gallon of water.

No. 2.—Hellebore 4 oz. to 1 gallon of water.

No. 3.—Kerosene emulsion, 1 part kerosene oil to 4 parts water.

No. 4.—Kerosene emulsion, 1 part kerosene oil to 6 parts water.

No. 5.—Kerosene emulsion, 1 part kerosene oil to 9 parts water.

No. 6.—Kerosene emulsion, 1 part kerosene oil to 12 parts water.

No. 7.—Paris green 2 oz. to 10 gallons water.

No. 8.—Tar paper disks.

No. 9.—No treatment.

These plots were treated June 18. An examination of a number of the cabbages at this date was made and no maggots could be seen. Some young maggots were found and eggs were being hatched around some of the cauliflowers at this date. The cauliflowers, however, were not included in this test. Notes were taken July 7, 14 and August 16. A summary of the data collected is given in the following table:—

No.	How Treated.	Killed by kerosene emulsion.	Killed by root maggot.	Injured by root maggot and did not recover.	Injured by kerosene emulsion and did not recover.	Weak growth.	Fair growth.	Vigorous growth.
		Plants.	Plants.	Plants.	Plants.	Plants.	Plants.	Plants.
1	Hellebore—2 oz. to 1 gall. water	....	....	....	....	....	6	94
2	Hellebore—4 oz. to 1 gall. water......	....	....	....	....	....	7	93
3	Kerosene emulsion—1 part oil to 4 parts water......	36	17	23	14	9	1	....
4	Kerosene emulsion—1 part oil to 6 parts water.....................	30	16	16	17	17	4	....
5	Kerosene emulsion—1 part oil to 9 parts water.....................	11	27	41	....	11	6	4
6	Kerosene emulsion—1 part oil to 12 parts water......	....	36	41	....	14	8	1
7	Paris green—2 oz. to 10 gall. water. ..	....	29	39	....	27	3	2
8	Tar paper disks put on June 1........	....	27	36	....	22	11	4
9	No treatment	....	62	20	....	12	6	....

It will be seen that kerosene emulsion in this test has given unsatisfactory results. It appears that an emulsion stronger than one part of oil to nine of water will do serious injury, and that a weaker strength does not appear to have much effect on the eggs or maggot. The kerosene emulsion was applied with a force pump using a single jet of liquid, forcing about a cup full of the mixture into the soil around the base of each plant.

The tar paper disks put around the plants on June 1, did not give as good results as expected. This may possibly have been due to the disks not having been put around the plants early enough. The object of these disks is to prevent the insects from depositing their eggs, which it is claimed they will not do, if these disks are fitted closely around the plant at the surface of the ground.

The hellebore and water recommended by Dr. James Fletcher, Entomologist and Botanist of the Experimental Farms, exceeded expectation, and no root maggots could be found around any of the plants examined in these two plots. The cabbage in these two plots were the only good ones out of some 1,500 plants set. There was no noticeable difference between plot No. 1 and 2, and the heads averaged practically the same. The hellebore was mixed with water and applied with a force pump in the same manner as the emulsion. An equally good way, we should fancy, would be to move some of the earth back from the base of the plant and pour about a cup full of hellebore water into this hollow around the plant. About one cupful of liquid was used to a plant in these plots. Further experiments will be carried on with this material. As far as one can judge from a single season's experience, we are inclined to think that this will prove an excellent remedy for the root maggot. The cabbages were equally infested at the base of the root with eggs when the mixture was used.

CUTWORM—POISONED BRAN REMEDY.

The Red-backed Cutworm *Paragrotis ochrogaster* was extremely troublesome around the flower beds and in the vegetable plots this season. It was found, however, that this pest could be easily controlled by using the poisoned bran bait recommended by Dr. James Fletcher. The poisoned bran is scattered on the ground around the plants, and if fowl are allowed to run where it has been used there is considerable danger. We found that chickens were killed by picking up pieces of the bran six weeks after it had been applied.

Dr. Fletcher advises one pound of Paris green to 80 pounds of bran, which is equal to 1 oz. of Paris green to 5 pounds of bran. The quantity used here was 3 ounces to 10 pounds of bran. The method adopted was to mix 3 ounces of Paris green in a quart bottle nearly full of water by shaking violently. This was added to a little over one-half gallon of water and poured slowly into the bran while it was being stirred with a stick. It is very important to mix the Paris green water thoroughly with the bran in order to get each flake of bran coated with some of the Paris green particles. The bran should be dampened just sufficiently to scatter nicely for if it is too wet this cannot be done to so good advantage.

Ten pounds of bran mixed in this way was found to do 500 feet of a row thoroughly. After it was used in this quantity, on beans where the cutworm was doing the most damage, few plants could be found cut off after the first night, and after the second night no plants were found destroyed. For plants, a greater distance apart, less bran would be required, for it is necessary to only scatter a ring of bran around each one.

The cutworm feeds during the night, cutting off the plant at the surface of the ground. They appear to have a fondness for bran and will feed upon it in preference to plants. A case particularly striking was noticed in the flower garden this year. Bran bags were used to protect some tender annuals from a June frost, and out of one of the bags a handful or two of bran happened to be deposited in one place. This ground was stirred in weeding about a week after and it was noticed that cutworms were collected in the soil under the bran while plants uninjured were close by. On a close examination, eight cutworms were found together, they evidently finding the bran a more suitable and convenient material to feed upon. Experience shows that this is a practical and efficient remedy for controlling this pest.

GARDEN PEASE.

Experiments were conducted with six of the leading early sorts of garden pease to find out the number of pounds of marketable green pease in pod from each. The plots were two rows, each 66 feet long, equal to 1-165 of an acre. These were all fertilized at the rate of 500 lbs. complete fertilizer per acre. The seed was sown May 12, in rows 2 feet apart, and the seed was dropped 2 inches apart in the rows. The soil was a poor sandy loam. The following yields were obtained per acre. Owing to the very dry season these peas did not grow well, and the yield per acre was small:—

Name of Variety.	Date of First Picking.	Pounds from First Picking.	Date of Second Picking.	Pounds from Second Pick'g.	Yield per Acre.
					Lbs.
Station	July 12	33	July 18	10	7,095
Thos. Laxton	" 14	25	" 21	20¼	7,507
Gradus	" 14	28¼	" 21	12¾	6,765
Prosperity	" 14	28¾	" 21	9½	6,270
Nott's Excelsior	" 14	29	" 24	18¼	7,796
American Wonder	" 14	6½	" 24	42	8,001

FERTILIZER EXPERIMENTS WITH GARDEN PEASE

Experiments were conducted with two kinds of early garden pease by dividing the land devoted to each into three plots. On one complete fertilizer, 'Imperial' brand, at the rate of 500 lbs. per acre was used, on another 250 lbs. per acre, and on the other third, no fertilizer was used. The seed was sown May 12 in rows 2 feet apart, and the seed dropped 2 inches apart in the row. The soil was a light clay loam in a poor state of fertility. Each plot was 2 rows, each 66 feet long. The growth of vine was short and the yield not as large as usual. The yield obtained from these plots is given in the following table.

If we consider the weight of green peas in pod at 40 lbs. to the bushel, we find that we have a gain in the first variety tested of 44 bushels per acre, where 500 lbs. of fertilizer was used per acre, than where not fertilized. If we allow pease in the pod to be worth 30 cents per bushel, we have a gain of $13.20 per acre. The fertilizer cost $7.50 per acre—a net gain of $5.70 per acre in favour of the heavily fertilized plot. With the variety Thomas Laxton there is a still larger gain from the use of the fertilizer.

GARDEN PEASE—FERTILIZER EXPERIMENTS.

Name of Variety and how treated.	Date of First Picking.	No. of Pounds from First Picking.	Date of Second Picking.	No. of Pounds from Second Picking.	Total Yield per Acre in Pounds.
'Station'—Complete fertilizer, 500 lbs. per acre..	July 12...	33	July 18...	10	7,095
Complete fertilizer, 250 lbs. per acre........	" 12...	31½	" 18...	10	6,847
No fertilizer........................	" 12...	27	" 18...	5¼	5,321
'Thomas Laxton'—Complete fertilizer, 500 lbs. per acre	" 14...	25	" 21...	20¼	7,507
Complete fertilizer, 250 lbs. per acre..........	" 14...	23	" 21...	13¾	5,987
No fertilizer..................	" 14...	23½	" 21...	8	5,156

SNAP BEANS.

Experiments were conducted with fifty-four varieties of snap beans. The seed was planted May 30, being dropped 2 inches apart in the row and the rows 2 feet apart. The ground was previously in horse-beans and was manured in the fall of 1903 with 15 one-horse cart loads af stable manure per acre and ploughed. This spring the ground was worked up into good tilth with the spade, springtooth, and smoothing harrows. The plots were one row, 33 feet long. A duplicate plot of one row 33 feet long was also planted which was allowed to ripen if the season permitted. These were cultivated frequently to keep the ground loose and friable.

These beans made fair growth. The cutworm did some damage, but was quickly checked by using the poisoned bran mash, which was scattered along the row. The rust *Anthracnose* did not develop on the beans until after the middle of August, when some of the plots were attacked quite badly. Some of these varieties which have in the past appeared quite rust-proof, were this year the worst affected, and some sorts that were formerly badly attacked were this season quite free.

From experience gathered from time to time, it would appear that the varieties Bountiful and Improved Goddard are two of the best green podded sorts for general market. Refugee or 1,000 to 1 is an excellent late green podded sort, and Market Wax, Keeney's Rustless Wax and Valentine Wax, are three excellent golden-podded kinds. The following notes were taken from the plots tested :—

SNAP BEANS—TEST OF VARIETIES.

Name of Variety.	When first fit to use.		First Picking, Aug. 4.	Second Picking, Aug. 12.	Third Picking, Aug. 23.	Total Yield from plot.	Length of Pod.	Colour of Pod.	Form of Pod.	Remarks.
			Lbs	Lbs	Lbs	Lbs	Inch's			
Extra Early Edible Podded	July	28	5¾	4	2¼	12	4½—5	Green..	Round..	Stringless, good, no rust.
Haricot or Golden Skinless	"	28	6	5	2½	13½	4 —4½	Golden.	" ..	" "
Emperor of Russia........	"	28	4¾	6	4	14¾	5½—6	Green..	" ..	" "
Matchless	"	28	5	4¾	3	12¾	5 —5½	" ..	" ..	Stringy, fair "
Dwarf German Black Wax	"	28	5½	10½	4½	20½	4½—5¼	Golden.	" ..	Few strings, good "
Green Pod Lightning.....	"	28	7¾	4¾	2¾	15¼	4¾—5¼	Green..	Flat...	" "
Valentine Wax..	"	28	6½	11	9¼	26¾	5 —5¼	Golden.	Round..	Stringless, good "
Early Warwick	"	28	11¼	8	7¾	27	4½—5	Green..	Flat....	Some strings, fair "
Dwarf Horticultural......	"	28	6¾	12¾	6¾	26¼	5 —5½	" ..	"	Stringless, good "
Davis Kidney Wax.......	"	28	5¾	9	4¼	19	5¾—6½	Golden.	"	" some rust.
Bountiful	"	28	9¾	15½	6¼	31½	6 —7	Green..	"	" no rust.
Brittle Wax..............	"	28	¼	4	3	7¼	4½—5½	Golden.	Round..	" slight rust.
Grencell's Rust Proof. ...	"	28	3½	7	2½	13	4 —4½	" ..	Flat....	" "
Market Wax.............	"	28	3¼	8½	5½	17¼	5 —5¾	" ..	"	" no rust.
Currie's Rust Proof.......	"	28	5½	9¼	1¼	16	5¼— 6	" ..	"	Some strings, fair, some rust.
Davis' Dwarf White Wax.	"	28	3¾	6	3½	13¼	6 —6¾	" ..	" ...	Stringless,good,some rust
Early Mohawk.	"	28	1¾	5	5¾	12½	5¼—5¾	Green..	"	Some strings,fair, no rust.
Wardwell's New Kidney..	"	28	5½	4	3¼	12¾	5¼— 6	Golden.	"	Stringless,good,some rust
Flageolet Wax	"	28	3¾	5½	2½	11¾	6 — 7	" ..	"	" "
Early China..............	"	28	3½	4¼	1¼	9	4¾—5¼	" ..	"	Some strings, fair, no rust
Keeney's Rustless	"	30	5½	8	1¾	15¼	5¼—5¾	" ..	"	Stringless,good,some rust
Improved Golden Wax....	"	30	2½	8¾	3	14¼	4 —4½	" ..	"	" fair, slight rust
Perfection Wax	"	30	1½	7	3¾	12¼	6¼—7¼	" ..	"	" good "
Golden Crown...........	"	30	2½	6½	4½	13½	4 —4¼	" ..	Round..	" no rust.
Extra Early Refugee......	"	30	3½	7½	2¼	13¼	4¾—5¼	Green..	" ..	" "
Saddle Back Wax	"	30	2	5½	2	9½	4½—5	Golden.	" ..	" slight rust
Round Yellow Six Weeks.	"	30	1½	4¾	2½	8¾	4¼—4¾	Green..	" ..	" no rust.
Ne Plus Ultra............	"	30	4	5¾	1¾	11½	5¼—5¾	" ..	Flat....	Some strings,fair, no rust.
Blue Podded Butter......	"	30	1¼	5	1¾	8	5½—6	Blue...	"	Stringless, good "
Don Carlos...............	"	30	3½	3¼	1¼	8	4 —4¼	Green..	"	Some strings,fair, no rust.
Early Giant Wax	"	30	2	6¼	2¾	11	5¼— 6	Golden.	"	Stringless, good "
Best of All..............	"	30	2¼	4¾	2¾	9¾	5¾—6¾	Green..	"	" "
Challenge Black Wax	Aug.	3	¾	3¾	3	7½	4½— 5	Golden.	Round..	" some rust.
Early Golden Eye........	"	3	1¾	4½	1¾	8	4½—5	" ..	Flat....	Some strings, fair,no rust.
Long Yellow Six Weeks ..	"	3	2½	7½	2	12	5¾—6¼	Green..	"	Stringless, fair "
Longfellow.	"	3	1¼	9	3	13¼	5 —6¾	" ..	Round..	" good, slight rust
Knickerbocker	"	3	1½	5¾	4½	11¾	5 —5¾	" ..	" ..	" some rust.
Stringless Wax.	"	3	1½	11½	7¼	20¼	5¾—6½	Golden.	Flat....	" "
Golden Scimitar..........	"	4	1¼	2¼	2	5½	5 —5½	" ..	Round..	" slight rust
Earliest Red Valentine ...	"	4	¼	4¾	2	7	4¼—5	Green..	" ..	" no rust.
Improved Goddard	"	4	½	8	14¾	24	6 —6½	" ..	Flat....	" "
White Kidney..	"	4	½	4¾	9½	14¾	5 —6	" ..	"	Some strings, fair "
Fame of Vitry...........	"	4	2¼	8	16¼	26½	6 —7	" ..	"	Stringless, good "
Refugee Wax.....	"	4	½	9¾	1	11¼	4 —4¼	Golden.	Round..	" "
Cylinder Ivory Podded ...	"	4	1	3½	3	7½	4½—5¼	" ..	" ..	" slight rust
Dwarf Chocolate..........	"	4	½	6	3	9½	5 —5¾	Green..	" ..	Some strings, fair,no rust.
Pencil Pod Wax	"	4	¾	3¼	1¼	5¼	4¾—5¼	Golden.	" ..	Stringless,good,some rust
Giant Stringless	"	4	½	4¾	2	7¼	4¾—5¼	Green..	" ..	" "
Burpee's Stringless . ..	"	4	1½	3¾	1¾	7	4½—4¾	" ..	" ..	" no rust.
Royal Dwarf Kidney	"	4	½	2¾	6	9¼	4½—5½	" ..	Flat....	Stringless, fair "
Cream Valentine.........	"	4	1¼	4¾	4	10	4¼—4¾	" ..	Round..	" good "
Refugee or 1,000 to 1......	"	12	....	4¾	8½	12¼	4½—5¼	" ..	" ..	" "
Black Speckled.... . .	"	12	....	10	5½	15½	6½—8	Green..	Flat....	Some strings,fair, no rust.
Eclair.	"	12	....	3¼	6	9¼	6½—8½	" ..	Round..	" "

ONIONS.

The ground on which the onions were grown was in a fairly good state of fertility. The soil was a light clay loam well drained but lacking somewhat in humus; so essential to make it an ideal soil for this crop. The best soil for onions is a light clay

loam abounding in decomposed vegetable matter, and well drained either naturally or artificially. Almost any good garden soil can be put into shape to grow a good crop of onions by using a liberal supply of manure for one or two years in succession to get a large supply of readily available plant food. The ground should be manured in the fall and ploughed under. In the spring this can be ploughed again and the manure thoroughly incorporated by using the disc and springtooth harrows. Poor soil will not produce good onions, and it requires several years of enriching to bring such soil into condition for the successful culture of the crop. The same ground can be used year after year unless disease or root maggots attack the crop, in which case a change is necessary.

The ground on which these onions were grown was previously in roots and was manured in the fall of 1903 with fifteen one-horse cart loads of stable manure per acre, which was ploughed under. It was again manured this spring with fifteen one-horse cart loads of stable manure per acre. The ground was worked into good tilth and the manure thoroughly mixed with the soil, and was run into rows two feet apart.

Complete fertilizer at the rate of 500 lbs. per acre was sown broadcast and lightly harrowed in with the smoothing harrow before the rows were run up. This crop requires a liberal amount of plant food in a readily available form, consequently, the liberal use of commercial fertilizer is necessary. A complete fertilizer is the best; that is one containing nitrogen, potash and phosphoric acid. Wood ashes can be used to good advantage to supply potash.

This ground was intended for roots and was run into rows 24 inches apart. These rows were raked down somewhat and the plots set in rows 2 feet apart. Onions are usually set in rows one foot apart on the level ground. The yield per acre on these plots is calculated from the number of pounds obtained from one row 66 feet long, allowing two feet of space for each row or equal to 1-330 of an acre for each plot; consequently, had these been grown in rows one foot apart the crop yield per acre would have been larger than what is given in this report.

Owing to the shortness of the season here satisfactory results cannot be had from growing onions from seed sown in the ground, although the variety Extra Early Red, will do fairly well in this way. The practice now followed is to start the plants in the hot-bed and transplant to the open ground. The transplanting does not entail much more labour than thinning the plants of seed started in the open.

The seed for these plots was sown in boxes, 15 by 30 inches, holding six inches deep of soil, on March 24. The seed was planted in drills $\frac{3}{4}$ of an inch deep in rows 3 inches apart, using 10 to 12 seeds per inch. It requires 6 or 7 weeks from the date of sowing to get good plants for transplanting. The soil used in these boxes was a rich loose sandy loam. The boxes were set into a hot-bed made March 9, which had a good even bottom heat. They were given ventilation on warm days, and sufficient moisture was supplied to produce good thrifty growth. Onions should not be forced in the hot-bed, as a spindling growth is not wanted, and makes very unsatisfactory plants for transplanting. After May 1 the glass is left off the hot-beds entirely. This hardens up the plants for setting in the open.

Transplanting to the open should be done as early in May as possible, and the nearer the plants can be got to about the size of a lead pencil at this time the better. The boxes were taken to the field when ready for transplanting, May 21. The plants were set 3 inches apart, using a garden line to set by. They were set as deep as the plants were in the starting box. The crop was frequently cultivated to kill weeds, keep the ground loose and friable, conserve moisture, admit air and allow the bulbs to readily develop.

Harvesting should be done when the most of the necks have turned yellow and are considerably withered. It is not advisable to defer this operation much after the middle of September. Even at this time some green tops will be found in the earliest maturing varieties, but they will soon dry up after harvesting. They should be pulled and left in rows for a week or ten days. If there is danger from frost they should be

stored in a shed or barn floor and left dry, after which they can be topped and sorted for market.

The best onion for the average grower is the Australian Brown. For the experienced market gardener the Prize taker will prove the most profitable. The following table gives the date on which these plots were pulled and the yield per acre.

ONIONS—TEST OF VARIETIES.

Name of Variety.	When Harvested.	Yield per Acre. Bush.	Lbs.	Size of Onion.	Colour of Skin.	Remarks.
Prizetaker	Sept. 23	342	40	Large	Yellow	Fairly well matured. Large cropper.
Trebon's Large Yellow	" 23	300	00	"	"	Not well matured.
Australian Brown	" 13 & 23	228	15	Medium.	Brown	Well matured. One of the best.
Golden Globe	" 13 & 23	228	00	"	Yellow	" " "
Australian Yellow Globe	" 13 & 23	214	30	"	"	" " "
Yellow Globe Danvers	" 23	156	45	Large	"	Not well matured.
Large Red Wethersfield	" 23	154	00	"	Red	" "
Red Wonder	" 13 & 23	148	30	Medium	Brown	Well matured. Apparently a strain of Australian Brown.
Market Favourite	" 23	137	30	Large	Yellow	Not well matured.
Extra Early Red	" 13	137	30	Medium	Red	Well matured. A good flat early kind.
Vanguard	Aug. 16	111	22	"	White	Well matured. Good for early market.
Mammoth Silver King	" 24	83	52	Large	"	Well matured. Did not do as well as usual.
Paris Silver Skin	" 24	60	30	Small	"	Well matured. Good for pickling.

SQUASH, PUMPKINS AND CITRON MELON.

Eight of the leading varieties of squash, two of pumpkins and one of citron melon were started May 9 in strawberry boxes filled with earth, set in the hot-bed. These were kept quite cool and were not forced, but made a good strong growth. They were set into hills in the open ground June 1 by cutting the boxes and setting the plants without disturbing the soil around the roots. Five seeds were put into each box, and after they started all but three plants to a box were thinned out. Three of these boxes were set to a hill and later on the plants were thinned out to six plants to a hill.

The hills into which these were set were made May 28 by digging out some of the top soil to a depth of six inches, two feet long and one foot wide, and putting into and tramping manure to a depth of four inches and covering with three or four inches of soil. The plants from the boxes were set practically on the manure.

A duplicate set of the plots started in the hot-bed were started by planting the seed in these hills May 28. About one dozen seeds were planted to a hill, and they were later thinned to six plants to a hill. These hills after planting were covered with a 12 x 20 glass set on a frame of wood, three inches high. Under this enclosure

the seed quickly germinated and by the middle of July the plots were apparently as far advanced as those started in the hot-bed. After the plants have appeared under this glass, the glass should be removed during part of bright days, and after the middle of June should be removed altogether. The hills were 12 feet apart each way.

The first cutting was made from these plots September 2, when the then matured squash were gathered and weighed. The balance of the crop was harvested September 21. There appears to be little difference between the two sets of plots. The Boston Marrow is probably the best autumn squash, and the Hubbard the best winter squash.

The Warted Hubbard is similar to the Hubbard, except that it has a rougher shell. It has proven to be a heavier cropper also than the Hubbard tested here. The Golden Hubbard is an excellent sort, but small. The following crop was taken from these plots:—

SQUASH, CITRON MELONS AND PUMPKINS—EXPERIMENTS WITH.

Name of Variety.	How Started.	Sept. 2.		Sept. 21.		Total Number Harvested	Total Number of pounds from Hill.	Average Weight of Squash Harvested.	Colour.
		Number Harvested.	Weight.	Number Harvested.	Weight.				
SQUASH.			Lbs.		Lbs.		Lbs.	Lbs.	
Hubbard	Outside	1	8	4	40½	5	48½	9·7	Green.
	Hotbed	1	15½	4	29½	5	45	9·	
Warted Hubbard	Outside	2	31	4	54	6	85	14·1	"
	Hotbed	2	39½	5	46	7	85½	12·2	
Golden Bronze	Outside	1	16½	6	39½	7	56	8·	Dark grayish green.
	Hotbed	1	10	7	47½	8	57½	7·2	
Bay State	Outside	2	19¾	4	29½	6	49¼	8·2	Blue.
	Hotbed	2	20½	4	36	6	56½	9·4	
Boston Marrow	Outside	5	40	3	33½	8	73½	9·2	Bright orange.
	Hotbed	3	32½	3	32	6	64½	10·7	
Dunlop's Early Marrow	Outside	4	46	6	42¼	10	88¼	8·8	Orange yellow.
	Hotbed	4	37½	3	31	7	68½	9·8	
Golden Hubbard	Outside	4	33	5	29	9	62	6·9	Deep orange yellow.
	Hotbed	4	28¼	3	18½	7	46¾	6·6	
Essex Hybrid	Hotbed	3	34	2	14	5	48	9·6	Orange yellow.
CITRON MELON.									
Colorado Mammoth, Preserving.	Outside	2	21	8	48	10	69	6·9	
	Hotbed	7	68¾	5	33	12	101¾	8·5	
PUMPKINS.									
Sugar	Outside	2	10¾	8	49	10	59¾	5·9	Deep orange, good keeper,
	Hotbed	2	13½	9	41¼	11	54¾	4·9	excellent quality.
Jumbo	Hotbed	1	28½	2	57	3	85·5	28·4	Large yellow.

LIST OF THE BEST VEGETABLES TO GROW.

The following list of vegetables are considered the best for general culture. We find from our tests that a number are practically of equal merit; yet, we feel safe in recommending the following as equal to any of the different sorts of vegetables tested here:—

Pease.—Extra early: Surprise. Early: Thomas Laxton, American Wonder, Nott's Excelsior. Medium: McLean's Advancer, American Champion. Late: Juno, Heroine and Stratagem. The height of these as recorded this year are: 22, 30, 19, 16, 30, 32. 16, 24 and 14 inches respectively.

Tomatoes.—Sparks' Earliana.

Beans.—Green Pod. Early: Bountiful and Improved Goddard. Late: Refugee or 1,000 to 1. Golden Pod: Market Wax, Valentine Wax and Keeney's Rustless Wax.

Corn.—Extra early: Extra Early Beverly. Early: Extra Early Cory and Premo. Medium: Crosby's Early.

Cucumbers.—White Spine. The Cumberland is excellent for pickling.

Squash.—Autumn: Boston Marrow and Golden Hubbard. Late: Hubbard.

Parsnips.—Hollow Crown and Improved Half Long.

Carrots.—Chantenay.

Onions.—Prizetaker and Australian Brown.

Lettuce.—Curled: Black Seeded Simpson. Cabbage: Improved Salamander, Cos. Trianon.

Cabbage.—Extra early: Paris Market. Early: Jersey Wakefield. Medium: Early Spring and Succession. Late: Late Flat Dutch, Late Red, Red Dutch.

Celery.—Paris Golden Yellow Self-Blanching, Improved White Plume and Winter Queen.

Cauliflowers.—Early Snowball and Early Dwarf Erfurt.

Beets.—Eclipse.

Spinach.—Victoria.

Salsify.—Sandwich Island.

Radishes.—French Breakfast and Icicle. Winter: Long Black Spanish.

Parsley.—Double Curled.

Citron Melon.—Colorado Mammoth.

Peppers.—Cayenne.

Water Melon.—Cole's Early and Phinneys' Early.

Egg Plants.—New York Improved Purple.

Brussels Sprouts.—Improved Dwarf.

Kale.—Scotch Dwarf Green Curled.

Asparagus.—Conover's Colossal.

Rhubarb.—Victoria and Linnæus.

Turnips.—Early: Extra Early Milan and Golden Ball. Swede: Selected Purple Top.

I have the honour to be, sir,
Your obedient servant,

W. S. BLAIR,
Horticulturist.

EXPERIMENTAL FARM FOR MANITOBA

REPORT OF S. A. BEDFORD, SUPERINTENDENT.

BRANDON, MAN., November 30, 1904.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa, Ont.

SIR,—I have the honour to submit, herewith, my sixteenth annual report, with details of experiments undertaken and work accomplished on the Brandon Experimental Farm, during the year.

The past winter was a very cold and stormy one, the last half of January and all of February being particularly so, heavy drifts formed during March and April, filling bluffs of timber and ravines to their full capacity, in some instances native poplar trees were completely stripped of their branches by the weight of snow.

When the immense drifts of snow commenced to thaw, all the rivers rose to unusual heights and overflowed their banks. The flood prevented the sowing of grain on a portion of this farm, so the land was summer-fallowed and is now ready for next year's seeding.

Spring opened late, the first sowing was done here on April 28, fully three weeks later than the average.

The month of May was seasonable. June set in wet, and vegetation grew very rank and soft during the first two weeks of that month.

During the latter part of July and the beginning of August rains were very abundant throughout the province, and growth rapid.

The autumn was unusually favourable for harvesting and crops of all kinds were saved without injury from rain or snow.

A large amount of fall ploughing has also been done, which will allow of rapid seeding next spring.

Although there has been some loss from rust and frost, the injury has been quite local in its character, prices for produce have been higher than usual and the year was a profitable one for the farmer.

On the experimental farm the yield of wheat, owing to the ravages of rust, was only an average crop, but nearly all other products gave the largest returns in the history of the farm.

I beg to call your attention to the following experimental work undertaken here this year for the first time :—

The effect of early harvesting in lessening the injury to wheat by rust.

The results of sowing flax on newly broken virgin soil.

The suitability of flax stubble for different grain crops.

Growing clover in large fields with green fodder as a nurse-crop.

The improvement of pasture fields.

The fattening of swine on pease growing in the field. Barley compared with mixed grain for fattening swine. A comparison of one-year-old, with two-year-old steers for fattening purposes.

The use of incubators in raising poultry.

WHEAT.

The past season will be long remembered among the farming community, owing to the alarming reports prevalent regarding injury to our staple crop from rust.

As a rule this province is not subject to serious injury from rust in wheat, but the abundant rains of June and July, accompanied by several close sultry days, was unusually favourable to the spread of rust, and by August 15 many fields were badly discoloured from this cause. Where the injury was only slight, the colour of the straw was dull red, and the grain only slightly shrunken, but in the fields seriously injured, both heads and straw were of a dark brown colour readily distinguishable at a distance, and the kernel badly shrunken.

The badly injured fields were sometimes scattered among others comparatively free of rust, and often there was no apparent reason for the difference, but excessive growth of straw from any cause appears to encourage the disease. This was particularly noticeable on rank summer-fallow and land heavily manured for root crops.

Many fields lying under the shelter of belts or bluffs of timber were noticed to be badly affected, possibly for want of a free circulation of air; sheltered hollows also suffered badly, especially if the soil was rich in humus.

On this farm most of the uniform test plots were on sheltered land which had been ploughed early and well summer-fallowed, for this reason the growth of straw was very rank and the injury from rust much greater than on the larger fields more exposed and not so carefully summer-fallowed.

In the accompanying tables it will be noticed that some varieties are more subject to injury from this cause than others, all velvet headed kinds such as Hayne's Blue Stem were severely injured, while the Macaroni Wheats are comparatively uninjured, the yield large and kernel plump and heavy.

It will be noticed that a number of the cross-bred varieties are several days earlier than Red Fife, and in districts where there is danger of Red Fife being injured by fall frosts, I would strongly recommend a trial of one of these early ripening kinds, Early Riga is the earliest of all the varieties tested here, but it has not proved as productive as some of the others.

Preston Wheat although not as early as Riga, is more productive, and is usually several days earlier than Red Fife, the area sown to this wheat is increasing each year, especially in districts subject to autumn frosts. At present the millers here are paying the same price for Preston Wheat as they are for Red Fife.

Thirty-six varieties of spring wheat were tested this year, irrespective of Macaroni Wheat and Spelt. All were sown on May 4 on clay loam soil, summer-fallowed, in plots of one-twentieth acre. All the seed was treated with bluestone and the varieties were all free of smut.

SPRING WHEAT—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs	
Australian No. 9	Sept. 6	125	53	Fair	4	Beardless.	6,550	36	40	59¼	Slightly.
Red Fife	" 7	126	53	Stiff	3½	"	6,700	36	40	58½	Considerably.
Crawford	" 1	120	44	"	3	"	5,840	36		60¼	Slightly.
Australian No. 19	" 8	127	50	"	3½	"	6,840	36		59¼	Considerably.
Power's Fife (Minn. 149)	" 8	127	51	Weak	4	"	6,800	35		59	Slightly.
Chester	Aug. 6	125	52	Stiff	4	"	6,260	34		59¼	Badly.
Monarch	Sept. 8	127	51	Fair	3½	"	6,880	33	40	58¾	Considerably.
Preston	" 4	123	53	Stiff	3½	Bearded	6,420	33		56	"
Benton	" 1	119	47	"	4	Beardless.	5,520	31	20	58	Badly.
Huron	Aug. 29	117	52	Fair	3½	Bearded	6,520	31	20	56¼	Considerably.
Pringle's Champlain	Sept. 2	121	50	"	3½	"	6,120	31	20	58	"
White Fife	" 7	126	53	Stiff	3	Beardless.	5,600	31	20	57¼	"
Fraser	Aug. 27	115	41	"	3	Bearded	6.140	31		58¾	"
Advance	Sept. 1	120	51	"	3	"	5,840	31		57¼	Badly.
Admiral	" 6	125	53	"	3½	Beardless.	6,420	29	40	56½	Considerably.
Hungarian	" 1	120	47	"	3	Bearded	5,940	29	20	57¼	Badly.
Dawn	" 4	123	51	"	3	Beardless.	6,160	29		56½	Considerably.
Early Riga	Aug. 24	112	43	Stiff	3	"	5,420	28		58½	"
Byron	" 29	117	50	"	3½	Bearded	5,380	27	40	57	"
Hastings	Sept. 4	123	49	"	3	Beardless.	4,880	27		58¾	Badly.
Hayne's Blue Stem (Minn. 169)	" 5	124	50	Weak	4	"	7,380	27		55½	"
White Russian	" 2	121	47	"	4	"	7,200	26	40	58½	"
Weldon	" 4	123	53	Stiff	3½	"	7,120	26	20	57	"
Wellman's Fife	" 5	124	53	"	4	"	7,520	26	20	55½	Considerably.
Stanley	" 1	120	51	Fair	4	"	7,160	26	20	56	"
Percy	Aug. 31	119	50	Stiff	4	"	6,420	26	20	55½	"
Clyde	" 31	120	50	"	5	"	6,140	26		54¼	"
Minnesota No. 163	Sept. 4	123	52	Weak	4	"	6,560	25	40	56¼	Badly.
Laurel	" 4	123	53	Stiff	4	"	6,180	25	20	56	Considerably.
Countess	" 1	120	50	Fair	3	"	5,580	25	20	56	Badly.
Red Fern	" 1	120	51	Stiff	3½	Bearded	6,700	23	20	54½	Considerably.
Plumper	" 3	122	49	"	3	"	6,800	23	20	56½	"
Herisson Bearded	Aug. 29	117	46	Weak	2	"	5,860	22	20	55½	Badly.
Colorado	Sept. 2	121	51	Fair	3½	"	6,080	22		54	Considerably.
Rio Grande	" 6	125	50	"	3½	"	6,920	19	40	52½	"
McKendry's Fife	" 2	121	52	"	4½	Beardless.	6,520	16	20	57	Badly.

MACARONI WHEAT.

This class of wheat has proved almost free of rust, and for that reason it has during the past few years been much more productive than other varieties.

As this kind of wheat is unsaleable for milling purposes in this country, we do not recommend it for general cultivation.

The size of the plots used for this test was one-twentieth acre. The soil a clay loam, summer-fallowed. All were sown on May 4.

MACARONI WHEAT—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs	
Goose	Sept. 10	129	52	Fair	2½	Bearded	6,700	53	20	60	Slightly.
Roumanian	" 12	131	53	"	2½	"	6,180	45	20	61	Considerably.
Yellow Gharnovka	" 9	128	53	Weak	3	"	6,660	45	..	62¼	Slightly.
Mahmoudi	" 9	128	45	Fair	3½	"	5,320	44	40	61	"

EMMER AND SPELT.

In addition to the Common Emmer, incorrectly called Speltz in this country, a test has been made with one other Emmer and two kinds of Spelt.

The Common Emmer is not only the most productive but the weight per bushel is decidedly greater.

The Common Emmer has suffered during the past two seasons from the heads breaking from the straw just before harvest. For this reason, it may be better to harvest it before it is fully ripe.

The size of the plots used for this test was one-twentieth acre. The soil a clay loam, summer-fallowed. All were sown on May 4.

EMMER AND SPELT—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.	Proportion Rusted.
			In.		In.		Lbs.	Lbs.	
Common Emmer........	Sept. 9.	128	44	Weak ..	$2\frac{1}{2}$	Bearded..	6,260	4,140	Slightly.
Red Emmer	" 9.	133	50	Stiff ...	$2\frac{1}{2}$	" ..	6,720	2,780	"
Red Spelt..................	" 9.	131	48	"	$4\frac{1}{2}$	Beardless.	5,800	2,000	"
White Spelt............	" 9.	129	46	"	$4\frac{1}{2}$	" .	5,060	1,240	"

FIELD PLOTS OF WHEAT.

Owing to the Assiniboine river overflowing its banks, we were unable to sow as many large grain fields as usual and in some cases where fields had been sown the water partly destroyed the crop, making accurate returns impossible

Variety.	Rust.	Character of Soil.	Size of Field.	Date of Sowing.	Date of Ripening.	Weight per Bushel.	Yield per Acre.	
						Lbs.	Bush.	Lbs.
Preston	Little...	Clay loam...	6 acres..	May 2....	Aug. 23....	60	30	..
Laurel	None. ..	Sandy " ..	5 " ..	April 28....	" 17....	$59\frac{1}{2}$	24	36
White Fife................	" ...	" " ..	2 " ..	" 29....	" 22....	60	22	..
Red "	" ...	" " ..	4 " ..	May 2....	" 22....	$59\frac{1}{2}$	29	43
Huron...........	" ...	" " ..	1 " ..	April 29....	" 17....	60	31	..
Pringle's Champlain.........	" ...	" " ..	1 " ..	" 29....	" 17....	60	25	..

VARIETIES OF WHEAT GROWN FROM SELECTED AND UNSELECTED SEED.

As in former years, the largest heads were selected from standing grain of last year, and the seed was sown this year for comparison with unselected seed from the same plots.

The accompanying table gives the result of each individual variety. A summary is also given which shows the average yield from the selected wheat to be fifty-four pounds more than the unselected. All were sown on summer-fallow land. The soil was a clay loam.

WHEAT.

Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	Yield per Acre.		Weight per Bushel.
				Bush.	Lbs.	Lbs.
Countess, unselected	$\frac{1}{20}$ acre	May 4	Sept. 1	25	20	54½
" selected	$\frac{1}{20}$ "	" 4	" 1	24	20	54½
Stanley, unselected	$\frac{1}{20}$ "	" 4	" 1	26	20	54
" selected	$\frac{1}{20}$ "	" 4	" 1	29	..	54
Byron, unselected	$\frac{1}{20}$ "	" 4	Aug. 29	27	40	55
" selected	$\frac{1}{20}$ "	" 4	" 29	28	40	55

Average yield of 3 varieties (selected) 27 bush. 20 lbs.
" (unselected) 26 bush. 26 lbs.

CUTTING RUSTY WHEAT AT DIFFERENT STAGES.

Farmers found it somewhat difficult to decide on the most suitable time to cut fields of rusty grain. It was thought by many, that early cutting would arrest the rust, and allow the kernel to fill out in the stook. Others allowed the grain to fully mature before harvesting. For the purpose of gaining some information on this point, four plots of wheat were cut at intervals of one week and a record kept of the returns from each.

From the accompanying table it will be seen that the plot cut in the dough or late milk stage, gave the best results. This experiment should, however, be repeated before definite opinions are reached.

No.	Variety.	When Sown.	When Harvested.	Stage of Straw when Harvested.	Stage of Grain when Harvested	Yield per Acre.		Weight per Bushel.
						Bush.	Lbs.	Lbs.
1	Red Fife	May 18	Aug. 30	Quite green	In the milk	25	40	54
2	"	" 18	Sept. 6	Greenish	In the dough	26	..	54
3	"	" 18	" 13	Nearly ripe	Nearly hard	24	40	54
4	"	" 18	" 22	Quite ripe	Quite hard	24	20	54

EXPERIMENTS WITH THE USE OF BARN-YARD MANURE ON WHEAT.

The plots used for this test in 1903 were again sown with wheat this year. Five adjoining plots in fallow last year were also sown at the same time.

The series of plots selected for this purpose were laid out on the upper portion of the farm where the soil is quite light and somewhat exhausted.

The size of the plots was one-twentieth acre, and the soil a very light sandy loam. The previous crop was wheat. The variety sown was Red Fife, sown on May 13 and harvested from August 26 to September 1.

No. Plot.	Treatment in 1903.	Yield in 1903.		Yield in 1904.	
		Bush.	Lbs.	Bush.	Lbs.
1	10 loads per acre, rotted manure	13	30	18	40
2	No manure	16	10	19	..
3	10 loads fresh manure	18	..	24	..
4	Summer-fallowed in 1903	None.		23	20
5	Clover ploughed in	"		20	..
6	Peas ploughed in	"		21	20
7	10 loads rotted manure	"		24	40
8	10 " fresh "	"		25	40

SUMMARY.

1. The plots left without a crop in 1903 gave the largest average yields of grain this year.

2. The two plots treated with fresh manure gave larger returns than the two treated with rotted manure.

3. Peas used as a green manure gave better results than did clover for that purpose.

A TEST OF FERTILIZERS ON WHEAT.

With one exception the fertilized plots have this year given the largest returns. The same result was obtained with this experiment in 1902.

The size of the plots was one-fortieth acre. The soil a sandy loam, summer-fallowed. All were sown on May 18 and all harvested September 9. There was no smut, but considerable rust on all the plots. The variety of wheat sown on all the plots was Red Fife.

Plot.	—	Length of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
		Inches.	Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	100 lbs. per acre of nitrate of soda, half sprinkled when the grain was 2 in. high, balance when 6 in. high	45	3	4,720	31	20	56
2	200 lbs. per acre of nitrate of soda, half sprinkled when the grain was 2 in. high, balance when 6 in. high	"	"	4,400	30	00	55
3	No fertilizer used	"	"	4,960	30	40	55
4	Superphosphate, 400 lbs. per acre, spread just before sowing	"	"	5,800	33	20	56½
5	Muriate of potash, 200 lbs. per acre, spread just before sowing	"	"	4,720	34	40	57
6	A mixture, 200 lbs. superphosphate, 100 lbs. nitrate of soda, 100 lbs. muriate potash, per acre, half spread before sowing, half when grain was 2 or 3 inches high	"	"	4,080	35	20	58

PREVENTIVES OF SMUT IN WHEAT.

Bluestone and formalin were both used in the tests this year.

The plots were one-twentieth acre each, and the soil a very light sandy loam. The wheat was harvested from August 26 to September 1.

Variety.	How Treated.	Good heads on 9 sq. ft.	Smut heads.
Red Fife.	Sprinkled with 9 oz. of formalin to 10 galls. water................	379	
"	" " 1 lb. of bluestone to 1 pail "	389	
"	Not treated..	430	25

DEEP AND SHALLOW SOWING.

Two one-twentieth acre plots of Red Fife were sown on May 18, with a shoe drill. In one case the seed was sown 2 inches deep and the other 3½ inches. As each produced at the rate of 31⅔ bushels per acre the depth of sowing made no appreciable difference in the yield.

OATS.

Early sown oats in this part of Manitoba were generally a good crop, and on the experimental farm the uniform plots gave the best returns ever obtained here.

The land used for this purpose was sown with pease in May, 1903. These were ploughed down when in blossom, and the land cultivated on the surface for the balance of the season. This spring the land was harrowed and the oats sown at once. The growth was very rapid, but the straw remained stiff all summer, and there was no lodged grain at any time.

Many complaints are received each year of serious losses from rust in oats and requests for a remedy are numerous; while none of the varieties of oats tested on this farm are entirely free from rust, Banner is as little affected as any of them. As a preventive for rust, early sowing should be practiced. In every instance where late sowing has been done on this farm, rust has considerably injured a large proportion of the crop, while early sown oats on adjoining fields seldom, if ever, suffer much from this cause.

Four plots of oats were seriously injured by blackbirds. The plots were near water, and in spite of the free use of a gun, the birds destroyed a large proportion of the crop.

The test was made with forty-two varieties, on plots of one-twentieth acre each. The soil was a clay loam, the previous crop, pease, ploughed down, two bushels of seed per acre was used. All were sown on May 5.

OATS—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs	
Improved American	Aug. 26	113	49	Stiff	11	Branching	5280	134	4	36½	Slightly.
Golden Beauty	" 26	113	48	"	8	"	4920	132	32	36	Considerably.
Danish Island	" 26	113	41	"	9	"	5040	132	12	36½	"
Banner	" 27	114	47	"	9	"	5080	131	6	37½	Slightly.
Abundance	" 26	113	46	"	9	"	4500	130	20	35	"
Lincoln	" 26	113	47	"	8	"	5200	127	22	36½	Considerably.
Siberian	" 26	113	43	"	8	"	5520	127	22	35	"
Early Golden Prolific	" 23	110	50	"	9	"	4820	127	2	36	Slightly.
Wide Awake	" 27	114	48	"	8	"	5360	125	30	37½	"
American Triumph	" 26	113	48	"	9	"	4880	125	10	36½	None.
Waverley	" 26	113	43	"	9	"	5260	122	32	36½	Slightly.
Buckbee's Illinois	" 27	114	45	"	9	"	4900	121	26	36½	"
White Giant	" 24	111	49	"	9	"	5800	121	26	35½	Considerably.
Golden Fleece	" 26	113	47	"	11	"	5060	120	..	34	"
Scotch Potato	" 27	114	49	"	10	"	5880	119	14	36	Slightly.
Columbus	" 23	110	45	"	8	"	4640	117	22	35½	"
Thousand Dollar	" 22	109	46	"	9	"	5140	117	22	37½	None.
American Beauty	" 23	110	48	"	9	"	5140	117	22	34	Slightly.
Golden Giant	" 31	118	41	"	11	Sided	5780	116	16	35	Considerably.
Olive White	" 29	116	48	"	9	"	5580	116	16	36¼	Slightly.
Bavarian	" 23	110	44	"	9	Branching	4900	115	30	37½	Considerably.
Golden Tartarian	" 30	117	43	"	12	Sided	5780	113	18	34½	Slightly.
Irish Victor	" 23	110	43	"	9	Branching	5400	112	32	33½	Considerably.
Goldfinder	" 30	117	42	"	10	½ Sided	4840	111	26	34	"
Kendal White	" 25	112	46	"	10	Sided	5460	108	8	38¾	Slightly.
Black Beauty	" 24	111	43	Weak	9	Branching	5260	108	8	37	Considerably.
Joanette	" 30	117	44	"	8	"	5580	107	22	37	"
Twentieth Century	" 20	107	48	Stiff	9	"	4380	107	22	37½	None.
Pioneer	" 26	113	49	"	8	"	4900	107	2	38½	Considerably.
Tartar King	" 20	107	46	"	8	Sided	4440	105	30	40	"
Pense Black	" 30	117	51	"	9	"	5960	105	30	38	"
Milford White	" 28	115	47	"	10	"	5260	105	10	38½	"
Kendal Black	" 30	117	50	"	10	"	5980	104	24	38	Slightly.
Milford Black	" 29	116	42	"	9	"	5420	103	18	37½	"
Olive Black	" 29	116	49	"	10	Branching	5920	103	18	37¼	"
Pense White	" 28	115	49	"	9	Sided	5900	101	6	38¾	"
*Holstein Prolific	" 17	105	44	"	9	Branching	5120	100	20	34	Considerably.
Storm King	" 26	113	47	"	9	Sided	4680	90	..	37	Slightly.
*Mennonite	" 17	105	44	"	9	Branching	5080	90	..	26	Considerably.
*Sensation	" 23	110	46	"	9	"	5140	79	14	33	"
*Improved Ligowo	" 17	105	48	"	9	"	6360	58	8	31	Badly.
*Swedish Select	" 17	105	47	"	8	"	6460	54	4	29½	"

*Injured by Blackbirds.

FIELD PLOTS OF OATS.

The remarks given under the head of field plots of wheat apply to oats also, only two fields of this grain were left uninjured by the flood.

One field of Banner oats, 11 acres in extent, soil a clay loam, summer-fallowed, was sown on May 13 and cut on August 23. It gave a return of 73 bushels and 27 lbs. per acre, weighing 37 lbs. per bushel. There was very little rust and no smut in this field.

A field of American Beauty oats, 5 acres in extent, soil a clay loam, summer-fallowed, was sown on May 13 and cut on September 1. It gave a return of 81 bushels and 2 lbs. per acre, weighing 38 lbs. per bushel. There was very little rust and no smut in this field.

BARLEY.

This grain has given excellent returns and a heavy kernel. Among the six-rowed varieties I wish to call attention to Yale barley, a hybrid between Duckbill and Rennie's Improved, this variety stands second on the list of the most productive kinds tested here during the past five years, and it has also given excellent returns on nearly all the experimental farms.

We find that barley can be used to a good advantage as a cleaning crop, weedy land cultivated near the surface in early spring, then ploughed deep about May 20 and sown at once with six-rowed barley will generally give large returns, and also leave the land much cleaner of weeds.

Many inquiries are made regarding beardless varieties of barley. Champion and other varieties of this class have been under trial on this farm for many years, but the yield from them has generally been much below that of the bearded kinds, and the weight per bushel is invariably under the standard.

While all varieties of barley stood up well this year, we usually find the six-rowed varieties have the best straw. The two-rowed Thorpe kinds come next, while the Chevalier varieties are usually too weak for summer-fallow land in this climate.

Twenty varieties of six-rowed barley were tested. Size of plots one-twentieth acre. The soil was sandy loam, which had been summer-fallowed. All were sown on May 17 in the proportion of two bushels of seed per acre. There was no rust on any of the varieties.

BARLEY—SIX-ROWED—TEST OF VARIETIES.

Name of Variety.	Date of Ripening	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs.	Bush.	Lbs.	Lbs
Brome	Aug. 18	93	34	Fair....	3	3,900	66	32	52½
Yale	" 18	93	38	Stiff....	3	3,600	62	24	51½
Empire	" 18	93	38	"	3½	3,480	58	36	52½
Odessa	" 18	93	36	"	3¾	2,440	57	24	52
Claude	" 18	93	35	"	2¾	3,120	55	40	49½
Argyle	" 16	91	37	"	3	2,380	54	28	51
Trooper	" 18	93	34	" ...	3	3,780	54	28	52¼
Stella	" 16	91	33	"	3	3,600	53	16	52
Baxter	" 14	89	38	"	2½	2,740	53	16	53
Summit	" 18	93	34	"	3	2,980	52	44	52¼
Mansfield	" 18	93	37	"	3½	3,140	52	24	52
Garfield	" 17	87	34	"	3	2,980	52	24	52
Nugent	" 18	93	32	"	3	2,700	47	24	52
Mensury	" 14	89	37	"	3½	3,040	47	04	50½
Albert	" 13	88	37	"	3	3,560	46	32	53
Royal	" 14	89	34	"	3	2,780	46	12	50½
Rennie's Improved	" 14	89	36	"	3½	2,720	43	16	52½
Common	" 13	88	33	" . . .	3	2,340	42	44	52
Oderbruch	" 14	89	27	"	3	1,900	41	32	53½
Champion	" 10	85	33	"	3	2,120	21	32	46¾

Fifteen sorts of two-rowed barley were tested this season. The soil was a sandy loam, which had been summer-fallowed. All were sown on one-twentieth acre plots, on June 6, in the proportion of two bushels of seed per acre.

BARLEY—TWO-ROWED—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs	
Invincible	Sept.	7	85	45	Stiff....	5	4,380	63	36	50¾	Considerably.
Gordon	"	8	83	44	"	3	5,380	63	36	51½	Slightly.
Standwell	"	10	85	39	"	4	5,580	63	36	51¼	"
Fulton	"	7	82	40	"	3	5,140	59	28	51	"
Clifford	"	8	83	43	"	3½	5,180	58	36	52	"
Dunham	"	9	84	38	"	3	5,180	56	32	51	"
Sidney	"	7	82	38	"	4	3,720	55	40	50½	None.
Jarvis	"	7	82	44	"	4½	4,920	55	40	51½	Slightly.
Harvey	"	11	86	40	"	3½	3,620	55	40	51½	"
Canadian Thorpe	"	12	87	38	"	3	6,540	55	20	51¾	"
Danish Chevalier	"	12	87	34	"	4	4,720	53	36	50	"
Logan	"	12	87	40	"	4	5,080	52	24	51¼	"
Beaver	"	12	87	35	"	3½	5,580	52	24	52	Considerably.
French Chevalier	"	12	87	36	"	4	5,240	42	44	51	"
Newton	"	10	85	34	"	4	5,740	30	20	49½	Slightly.

EXPERIMENTS WITH FLAX.

Ten varieties of flax were under trial on the experimental farm. The crop was uniformly good and attracted much attention, particularly from the United States visitors, who are much interested in flax growing.

The St. Petersburg, Russian, Improved Russian, and Common are very similar in appearance. The La Plata has a decidedly spreading habit and branches much nearer the ground than the others. It is also about a week later.

The La Plata and Novarossick again head the list for productiveness, evidently they are very desirable kinds for this country.

These plots were all one-fortieth acre each.

FLAX—TEST OF VARIETIES.

Varieties.	Date of Sowing.	Date of Ripening.	Length of Straw.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			Inches.	Lbs.	Bush.	Lbs.	Lbs.
La Plata	May 19..	Aug. 26..	20	1,480	23	32	55½
Novarossick	" 19..	" 20..	23	1,760	22	8	55
Russian	" 19..	" 21..	25	1,640	20	40	55½
Riga	" 19..	" 23..	33	1,560	18	32	56
Yellow Seeded	" 20..	" 19..	27	1,560	18	32	55
White Flowering	" 19..	" 20..	27	1,600	17	48	56
Bombay	" 19..	" 26..	18	1,200	17	48	56
Improved Russian	" 20..	" 23..	34	1,720	15	40	56
St. Petersburg	" 19..	" 23..	28	1,760	11	24	56
Common	" 20..	" 23..	33	1,040	10	..	56

SOWING FLAX ON NEW BREAKING.

Many inquiries are received from new settlers regarding the advisability of sowing flax on new breaking. I have always recommended that new breaking be left unsown the first year, for the following reasons:—

1st. The yield of grain of any kind is comparatively small from breaking and the time can be more profitably used in breaking additional land.

2nd. It is almost impossible to procure flax seed free from foul weed seeds. We have found seven distinct varieties of wild mustard in one lot of flax procured for this farm.

3rd. For some unexplained reason, land sown with flax the first year fails to give full returns for several years afterwards.

Last year two plots of new prairie land were broken in May, one of the plots was sown with Common Flax as soon as broken and harrowed, the other was left unsown, but was ploughed a second time (backsett) in July. The plot sown with flax gave a yield of 8 bushels and 12 pounds per acre.

This year both were again ploughed and sown with Red Fife Wheat, with the following result:—

—	Date of Sowing.	Date of Ripening.	Weight of Straw.	Yield per Acre.	
			Lbs.	Bush.	Lbs.
Red Fife on backsetting	May 12	Sept. 5	4,200	33	20
" after flax crop	" 12	" 5	3,320	24	40

From the accompanying table it will be noticed that the plot left without a crop gave 8⅔ bushels per acre more wheat than the land sown with flax.

FLAX STUBBLE FOR GRAIN CROP.

On old land a grain crop following flax has usually given fair returns here. This is probably owing to the small amount of stubble left by a flax crop, permitting of a compact seed bed so necessary for the wheat plant. .

DIFFERENT PREPARATIONS FOR A WHEAT CROP.

All on plots of 1-20 acre each.

Preparation.	Rusted.	Date of Sowing.	Date of Ripening.	Weight of Straw.	Yield per Acre.	
				lbs. per ac.	Bush.	Lbs.
Wheat after flax	Considerably	May 11	Sept. 3	5680	43	40
" wheat	"	" 11	" 3	4880	37	..
" oats	"	" 11	" 3	4900	36	40
" barley	"	" 11	" 3	4080	33	40
" millet	"	" 11	" 3	3280	35	20
Wheat on summer-fallow	Badly	" 11	" 4	4540	32	46

DIFFERENT GRAIN CROPS FOLLOWING FLAX.

—	Date of Sowing.	Date of Ripening.	Weight of Straw.	Yield per Acre.	
			Lbs.	Bush.	Lbs.
Wheat (Red Fife) after flax	May 11	Sept. 3	5680	43	40
Oats (Banner) after flax	" 11	Aug. 26	4620	68	8
Barley (Mensury) after flax	" 11	" 22	3060	52	44
Pease (Mummy) "	" 11	Sept. 2	....	53	20

EXPERIMENTS WITH PEASE.

Thirty-one varieties of pease were on trial this year. The yield has been very much above the average and the sample excellent.

This grain is nearly always very productive here, the only obstacle to its more general cultivation is the difficulty in harvesting and threshing it.

The pea weevil is unknown, the sample is usually good and the weight per bushel high.

The soil selected this year was a sandy loam summer-fallowed, the size of the plots one-twentieth acre. All were sown on May 11, in the proportion of two bushels of seed per acre for the small kinds and three bushels for the larger ones.

PEASE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
					In.	In.		Bus.	Lbs.	Lbs.
1	Mackay	Sept. 11..	123	Rank.....	42	2½	Medium..	85	..	63½
2	Macoun	" 12..	124	"	37	2½	Small ...	79	40	64½
3	Picton	" 12..	124	"	36	2½	Large	77	10	63½
4	Arthur	" 2..	114	Medium..	34	2½	Medium..	77	..	65
5	King	" 8..	120	Rank.....	42	2	" ...	75	..	65
6	Carleton	" 10..	122	Medium..	37	2¼	Small	73	50	64¼
7	Paragon	" 10..	122	Rank.....	38	2½	Medium..	73	20	62½
8	Pearl	" 20..	133	"	46	3	" ...	73	20	62
9	Mummy	" 19..	132	"	53	2	" ...	73	..	64
10	Victoria	" 20..	133	"	44	3½	Large ...	71	40	64
11	Early Britain	" 5..	117	" ..	43	2½	"	71	..	61¾
12	Gregory	" 9..	121	Medium..	54	2½	Medium..	70	..	65½
13	White Marrowfat	" 20..	133	Rank.....	63	3	Large ...	68	20	64
14	Daniel O'Rourke	" 16..	129	"	46	2½	Small	67	..	65½
15	Golden Vine	" 5..	117	Fair.....	48	2	"	66	20	63¼
16	Pride	" 20..	133	Rank.....	54	2	Medium..	64	20	64¼
17	Archer	" 18..	131	"	43	2	" ...	64	..	64¼
18	Prince	" 18..	131	"	44	2½	" ...	63	20	64
19	Kent	" 18..	131	"	44	3	Large	61	20	64½
20	Prince Albert	" 15..	128	Fair......	63	2½	Small	60	40	63½
21	English Grey	" 18..	131	"	42	3	Medium..	60	..	61¾
22	Duke	" 20..	133	Rank.....	42	2	" ...	58	..	63
23	Prussian Blue	" 1..	113	Fair......	43	2½	" ...	58	..	65¼
24	Nelson	" 10..	122	"	33	2½	" ...	57	40	64¾
25	Crown	Aug. 25..	106	Weak	37	2	Small	57	20	65½
26	Wisconsin Blue	Sept. 10..	122	"	38	2	"	57	20	66
27	Agnes	" 6..	118	Fair......	42	2¼	Medium..	56	..	63½
28	White Wonder	Aug. 30..	111	Weak	34	2	Small	55	40	66
29	Black-eyed Marrowfat	Sept. 1..	113	Rank....	41	3½	Large	52	..	63½
30	Chancellor	Aug. 25..	106	Weak ..	32	2	Small	51	20	65½
31	German White	Sept. 5..	117	Medium..	36	2½	Large	50	20	65

EXPERIMENTS WITH INDIAN CORN.

The crop of Indian Corn was slightly above the average this year, but it was scarcely as far advanced as usual when harvested.

In addition to the uniform test of plots of corn, about eight acres were sown for feeding purposes, 38 tons of this was used for ensilage, and the balance cured in stooks, and will be fed during the winter months. We find that all classes of stock relish dry corn fodder, even horses are benefited by one meal of it a day during the slack months of winter.

The seed was sown on May 26, in rows 30 inches apart, using about half a bushel of seed per acre. The crop was cut on September 23. Twenty varieties were under trial. The soil was a rather light sandy loam and the previous crop was corn. The yields were calculated from two rows, each 66 feet long.

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	Height.	Leafiness.	When Tasselled.	In Silk.	Early Milk.	Late Milk.	Condition when Cut.	Weight per Acre grown in rows.		Weight per Acre grown in hills.	
		In.							Tons.	Lbs.	Tons.	Lbs.
1	Giant Prolific Ensilage	87	Very leafy ..	Aug. 29	....	......	....	In tassel	25	160	26	272
2	White Cap Yell'w Dent	87	Fairly leafy.	" 29	....	....	....	" .	24	840	24	48
3	Thoroughbred White Flint	76	Very leafy ..	" 29	....	....	....	" ..	24	840	22	1,672
4	Red Cob Ensilage....	90	Fairly leafy.	Sept. 1	....	....	....	" .	23	200	21	1,560
5	Superior Fodder	74	Very leafy ..	" 5	....	....	....	" .	22	1,408	22	352
6	Champion White Pearl	97	Few leaves .	Aug. 27	....	....	....	" .	21	768	19	808
7	Salzer's All Gold......	87	Very leafy ..	" 30	....	....	....	" .	21	240	23	1,520
8	King Philip..........	85	" ..	" 18	Aug. 23	Aug. 31	Sept. 6	L. milk.	20	920	18	960
9	Mammoth Cuban	75	Few leaves .	" 26	Sept. 1	....	....	In silk..	19	1,600	19	808
10	Cloud's Early Yellow.	86	" ..	" 29	....	....	....	In tassel	18	960	17	848
11	Longfellow	84	Fairly leafy.	" 17	Aug. 27	Sept. 16	....	E. milk.	18	432	18	1,488
12	Pride of the North ...	74	Very leafy ..	Sept. 1	....	....	....	In tassel	17	1,640	16	1,000
13	North Dakota White.	76	" ..	Aug. 18	Aug. 23	Sept. 1	Sept. 6	L. milk.	17	1,640	19	1,600
14	Angel of Midnight...	93	Leafy	" 19	" 30	" 5	....	E. milk.	17	1,112	17	1,376
15	Compton's Early.....	79	Fairly leafy.	" 18	" 26	" 1	....	" .	16	1,792	18	960
16	Early Mastodon......	84	Leafy	" 29	Sept. 5	....	....	In silk..	16	1,000	17	1,640
17	Early Butler.........	104	Quite leafy .	Sept. 1	....	....	....	In tassel	16	1,000	19	280
18	Eureka..............	76	Few leaves .	Aug. 30	....	....	....	" .	15	360	18	960
19	Selected Leaming	81	" ..	Sept. 1	....	....	....	" .	13	664	10	64
20	Evergreen Sugar....	73	Leafy	Aug. 28	....	....	....	" .	11	440	11	1,760

INDIAN CORN—SOWN AT DIFFERENT DISTANCES APART.

Name of Variety.	Distance apart.	Height.	Condition when Cut.	Weight per Acre, cut green for ensilage.	
	Inches.	Inches.		Tons.	Lbs.
Longfellow, 4 rows..........................	24	85	Early milk....	26	800
" 4 "	30	85	"	22	880
" 4 "	36	85	"	19	1,600
" 4 "	42	85	"	17	1,252
Selected Leaming..........................	24	81	In tassel......	16	1,000
"	30	81	"	15	1,680
"	36	81	"	14	600
"	42	81	"	17	1,438
Champion White Pearl	24	97	"	20	1,250
" "	30	97	"	19	1,072
" "	36	97	"	16	1,880
" "	42	97	"	15	160

INDIAN CORN.

Average Yield at Different Distances Apart.	Tons.	Lbs.
Average yield of green corn 24 inches apart..................................	21	350
" " 30 "	19	544
" " 36 "	17	26
" " 42 "	16	1,616

FIELD ROOTS.

The yield of all kinds of field roots has been unusually good on the experimental farm this year, and a few notes on our manner of growing them may prove useful to new settlers in this country.

For the best results soil intended for field roots should be rich, moist, and fairly free of weed seeds. These conditions can be obtained by sowing on manured summer-fallow land, or by using the same land continuously for a root crop, but alternating the kind of root from year to year; for instance, land in potatoes this year could be sown to turnips next season. The latter plan has been adopted here, and about ten loads of manure per acre is applied every second or third year. If all root tops and other rubbish is ploughed under deeply, just as soon as the crop is off, and the land rolled, there will be no trouble from cutworms.

All manure should be applied in the autumn. Only well rotted manure should be used, and it must be broken up fine for the best results.

All field roots should be sown much earlier than is generally practiced. Carrots can be sown May 1, turnips May 10, and mangels and sugar beets May 15.

Ridged drills dry out quickly, for that reason only level drills should be used.

TURNIPS.

Twenty varieties of turnips have been on trial at the experimental farm this year. The yield was the largest for years, and the quality good.

The soil was a sandy loam, manured in 1902, and the previous crop was potatoes.

As usual two sowings were made of each variety; in every instance the early sown plots gave the largest returns.

The first plots were sown on May 10, the second on May 23, and the roots from both were pulled on October 6. The estimate of yield has been made from the produce of two rows, each 66 feet long.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Good Luck	43	1,120	1,452	..	23	1,520	792	..
2	Jumbo	37	1,240	1,254	..	25	1,480	858	..
3	Magnum Bonum	34	640	1,144	..	25	1,480	858	..
4	Hall's Westbury	31	304	1,038	24	23	200	770	..
5	Bangholm, selected	30	720	1,012	..	22	880	748	..
6	East Lothian	29	1,400	990	..	21	768	712	48
7	Perfection Swede	29	1,136	985	36	21	1,560	726	..
8	Kangaroo	29	80	968	..	19	1,600	660	..
9	Hartley's Bronze	29	80	968	..	21	240	704	..
10	New Century	28	1,552	959	32	23	1,520	792	..
11	Selected Purple Top	28	760	946	..	22	616	743	36
12	Imperial Swede	28	760	946	..	23	200	770	..
13	Drummond Purple Top	28	760	946	..	21	1,560	726	..
14	Carter's Elephant	28	760	946	..	21	768	712	48
15	Emperor Swede	27	1,176	919	36	19	1,600	660	..
16	Sutton's Champion	26	1,592	893	12	21	768	712	48
17	Mammoth Clyde	26	1,328	888	48	23	1,520	792	..
18	Halewood's Bronze Top	26	1.328	888	48	19	280	638	..
19	Elephant's Master	26	800	880	..	19	1,600	660	..
20	Skirvings	26	800	880	..	22	880	748	..

EXPERIMENTS WITH MANGELS.

Sixteen varieties of mangels have been on trial at the experimental farm this year. The yield was excellent and the roots were saved free of injury from frost.

The soil used for this crop was a black loam fertilized in 1902, with ten loads of well-rotted stable manure, applied in the autumn. The previous crop was potatoes. The first sowing was made on May 7, and the second on May 21. All were harvested on September 24.

The estimate of yield has been made from the product of two rows each 66 feet long.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mam. Yellow Intermediate	39	1,992	1,333	12	31	568	1,042	48
2	Gate Post	37	712	1,245	12	29	872	981	12
3	Half Long Sugar White	35	1,544	1,192	24	31	40	1,034	..
4	Yellow Intermediate	31	1,624	1,060	24	38	32	1,267	12
5	Prize Winner Yellow Globe	31	1,360	1,056	..	30	1,512	1,025	12
6	Mammoth Long Red	31	1,096	1,051	36	27	120	902	..
7	Triumph Yellow Globe	31	568	1,042	48	28	760	946	..
8	Selected Mammoth Long Red	31	304	1,038	24	29	1,928	998	48
9	Leviathan Long Red	31	40	1,034	..	28	496	941	36
10	Giant Yellow Intermediate	31	40	1,034	..	31	304	1,038	24
11	Giant Sugar Mangel	29	80	968	..	27	648	910	48
12	Prize Mammoth Long Red	28	496	941	36	30	192	1,003	12
13	Lion Yellow Intermediate	27	648	910	48	24	1,104	818	24
14	Half Long Sugar Rosy	26	800	880	..	28	760	946	..
15	Giant Yellow Globe	25	160	836	..	35	1,280	1,188	..
16	Selected Yellow Globe	24	1,896	831	36	36	600	1,210	..

CARROTS.

Profiting by last year's experience, a deep friable soil was selected for this test. The land was ploughed deeply in the fall so as to give the root an opportunity to penetrate the soil. The previous crop was mangels.

Ten varieties were tried. The first sowing was made on May 7, the second on May 21. This year, with one exception, the first sown plots gave the largest yield.

The yield per acre has been calculated from the products of two rows, each 66 feet long.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
		Tons.	Lbs.	Bush	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	New White Intermediate	38	1,440	1,290	40	24	840	814	..
2	Long Yellow Stump Rooted	36	600	1,210	..	29	520	975	20
3	Ontario Champion	35	1,720	1,195	20	18	840	630	40
4	Improved Short White	33	440	1,107	20	26	1,680	894	40
5	White Belgian	33	.....	1,100	..	18	840	630	40
6	Carter's Orange Giant	31	1,360	1,056	..	25	1,040	850	40
7	Mammoth White Intermediate	30	280	1,004	40	24	1,720	828	40
8	Half Long Chantenay	28	760	946	..	24	1,720	828	40
9	Giant White Vosges	26	800	880	..	15	800	513	20
10	Early Gem	22	880	748	..	23	1,080	784	40

SUGAR BEETS.

Eight varieties of these roots were on trial this year. The season was a favourable one and a large crop of well-shaped roots was harvested.

Three of the varieties were tested by Mr. F. T. Shutt, Chemist of the Dominion Experimental Farms, Ottawa, and the juice of all was found fairly rich and pure. Full particulars of this test will be found in Mr. Shutt's annual report.

The soil was a black sandy loam. The previous crop was potatoes.

The first plots were sown on May 7, the second on May 21. All were harvested on September 24.

The estimate of yield has been made from the product of two rows, each 66 feet long.

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons	Lbs.	Bush.	Lbs.
1	Royal Giant	25	688	844	48	25	1,744	862	24
2	Red Top Sugar	24	48	800	48	25	1,480	858	..
3	Danish Red Top	23	992	783	12	23	464	774	24
4	Danish Improved	23	200	770	..	20	656	677	36
5	Wanzleben	22	880	748	..	18	1,488	624	48
6	Improved Imperial	21	504	708	24	24	840	814	..
7	French 'Very Rich'	21	240	704	..	14	1,040	484	..
8	Vilmorin's Improved	17	1,904	598	24	16	268	536	48

POTATOES.

Forty-one varieties of potatoes were on trial on this farm. The yield was larger than usual and the quality excellent. There was no injury from rot or other disease and they were free from the attacks of the Colorado beetle.

The soil selected this year was a sandy loam and the previous crop was turnips. The soil was fertilized with ten tons of well-rotted manure in the autumn of 1902.

The potatoes were planted on May 14 in rows three feet apart and dug on September 26. The yield has been estimated in each case from the product of one row 66 feet long.

It is quite evident from the experience gained on this farm during the past 15 years, that Early Rose potatoes, the kind usually grown here, are no longer as prolific as some other varieties, and I do not hesitate to advise the abandonment of that variety for others mentioned in the accompanying list. As potatoes increase rapidly, the 3-pound packages supplied free by the experimental farms will in a short time produce sufficient to supply a family. It is found that a somewhat long, pink-coloured potato, of the Early Rose type, gives the best satisfaction in this province. This class of potatoes are usually early, dry and mealy.

The following are some of the most productive varieties of this class : Maule's Thoroughbred, Canadian Beauty, General Gordon, Rose No. 9, Seedling No. 7.

POTATOES—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Growth.	When Matured.	Average Size.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
					Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Late Puritan	Rank ..	Sept. 5	Large ..	847	.	799	20	47	40	Long, round, white.
2	Prolific Rose..............	" ..	Aug. 25	" ..	656	20	616	..	40	20	Round, deep pink.
3	Dreer's Standard..........	" ..	Sept. 1	" ..	649	..	616	..	33	..	Flattish oval, white.
4	Money Maker............	Med....	" 16	" ..	634	20	590	20	44	..	Round " "
5	Sabean's Elephant.........	Rank ..	" 6	Med....	605	..	561	..	44	..	Long round "
6	Maule's Thoroughbred......	" ..	" 5	Large ..	568	20	553	40	14	40	" deep pink.
7	Rose No. 9....	" ..	" 6	" ..	561	.	539	..	22	..	" flat, deep pink.
8	Canadian Beauty..........	" ..	" 1	" ..	557	20	531	40	25	40	" round, lt. pink.
9	American Giant	" ..	" 6	" .	553	40	520	40	33	..	Round oval, white.
10	Uncle Sam	Med....	" 1	" ..	550	..	524	20	25	40	Flattish " "
11	Country Gentleman........	Rank ..	Aug. 26	Med....	550	..	509	40	40	20	Long, deep pink.
12	Empire State...........	" ..	" 29	Large ..	546	20	506	..	40	20	" white.
13	American Wonder.........	" ..	Sept. 6	" ..	546	20	509	40	36	40	Long round, white.
14	State of Maine............	" ..	" 6	" ..	542	40	506	..	36	40	Flat oval, white.
15	Irish Cobbler..............	Med....	" 1	" ..	539	..	487	40	51	20	Flat, white.
16	Carman No. 3.............	Rank ..	" 6	" ..	531	40	517	..	14	40	Long round, white.
17	Seedling No. 7...........	" ..	" 7	" ..	528	..	506	..	22	..	" deep red.
18	General Gordon....... ...	Med....	" 1	Med....	528	..	506	..	22	..	Long round, d'p pink.
19	Holborn Abundance.......	V. rank.	" 6	Large ..	524	20	491	20	33	..	Round, white.
20	Carman No. 1	"	" 6	" ..	517	..	484	..	33	.	Flat "
21	Pearce..................	Rank ..	" 1	Med....	509	40	502	20	7	20	Round, pink.
22	Cambridge Russet.........	" ..	" 1	Large ..	509	40	484	..	25	40	L'g round, d'p russet.
23	Enormous................	" ..	" ..	" ..	495	..	451	..	44	..	Roundish, white.
24	I. X. L.........	" ..	" 6	" ..	495	..	454	40	40	20	Long round, pink.
25	Delaware..............	" ..	" 5	Fair....	487	40	465	40	22	..	Long oval, white.
26	Rochester Rose...........	Med....	Aug. 28	Med....	465	40	451	..	14	40	Long round, l't pink.
27	Swiss Snowflake...........	V. rank.	Sept. 6	" ..	462	..	429	..	33	..	Irregular, white.
28	Clay Rose.................	Rank ..	" 6	Large ..	458	20	429	..	29	20	Flat oval, deep pink.
29	Penn Manor	Med....	" 1	" ..	429	..	410	40	18	20	Long " "
30	Reeve's Rose.............	Rank ..	" 6	" ..	407	..	388	40	18	20	Flat " light pink.
31	Everett	Med....	Aug. 25	" ..	366	40	333	40	33	..	Long " pink.
32	Burnaby Seedling.........	Rank ..	Sept. 5	" ..	355	40	333	40	22	..	Flat " "
33	Bovee.....	Weak ..	Aug. 20	Med....	352	..	315	20	36	40	Long " light pink.
34	Early St. George.........	Med....	Sept. 1	Large ..	348	20	333	40	14	40	" " deep pink.
35	Pingree................ ...	Weak ..	Aug. 25	Med....	341	..	311	40	29	20	Flat " white.
36	Early Andes....	" ..	" 24	" ..	330	..	300	40	29	20	Round oval, white.
37	Vick's Extra Early........	V. rank.	....	Large ..	326	20	304	20	22	..	Flat, pink.
38	Rawdon Rose.............	Weak ..	Aug. 25	" ..	315	20	293	20	22	..	Round oval, l't pink.
39	Early Envoy..............	Med....	" 31	Med....	315	20	389	40	25	40	" pink.
40	Early Rose...............	Weak ..	" 25	Large ..	282	20	271	20	11	..	" "
41	Early White Prize.........	....	....	....	264	..	231	..	33	..	" oval, l't pink.

GRASSES.

The past season has been a fairly satisfactory one for grasses and the yield was above the average. Bald Wheat grass (*E. Virginicus*) is a native of the province. We have found it quite vigorous on light dry locations where many other grasses give poor returns. It should be cut quite green, otherwise it cures a dark brown colour and is decidedly woody in texture.

Western Rye grass (*A. tenerum*) is also a native of this province. Although a more tender grass than the Wheat grass, it also should be cut directly the head is formed, otherwise the hay is tough and hard.

On this farm we have had good results from sowing a mixture of Western Rye grass and Austrian Brome, using 7 lbs. of each variety of seed. By this plan the Brome cures better and in the mixture the slippery character of pure Rye grass is not so noticeable.

Varieties.	When sown.	Seed per acre.	Yield of Hay per acre.	
		Lbs.	Tons.	Lbs.
Austrian Brome *(Bromus inermis)*	1902	12	2	700
" "	1903	12	1	1200
Western Rye Grass *(A tenerum)*	1902	12	2	500
" "	1903	12	2	1100
Bald Wheat Grass *(Elymus virginicus)*	1902	12	1	1300
Timothy	1902	8	1	700
Red Top *(Agrostis vulgaris)*	1903	8	..	1900
Hard Fescue	1900	20	1	1800

IMPROVING PASTURE FIELDS.

Every year large areas of new land in this country are brought under cultivation, and catle pasture becomes less plentiful, this has led many farmers to dispose of their herds, and engage exclusively in grain-growing. This is to be regretted, as mixed farming is the most desirable system of husbandry for any country.

On this farm it has been found possible to greatly increase the productiveness of a native grass pasture field, by ploughing up a portion of it each year, and seeding it down with Awnless Brome grass. If the sod is thin it can be ploughed deeply in April or May, then well disk-harrowed and sown at once with about 15 lbs. of Brome grass seed per acre, then harrowed a second time. If the land is fairly dry when seeding is done, we have not found it necessary to keep the cattle out of the field.

Where the sod is thick and tough, it is sometimes desirable to break the native sod a year in advance, and then backset it before sowing the seed. Should the Brome sod in time become too thick it may be ploughed during the summer and not harrowed or backset. This will kill a portion of the grass plants, and the remainder will become more vigorous.

The productiveness of native pasture fields can be greatly increased, if treated as above.

CLOVER.

The plots of clover have all passed another winter safely. The yield has been above the average, and the favourable weather enabled us to save the hay in good condition.

In addition to the one-twentieth acre plots of clover sown during 1902 and 1903, three one-acre fields were sown on June 1, 1904. The varieties were Alfalfa, Common Red and Alsike. The soil was a sandy loam summer-fallowed, half a bushel of barley per acre was first sown, with a drill, then 15 bs. per acre of clover seed was sown broadcast and harrowed in. Owing to the barley being thin, the clover made a good stand of stocky plants. Just as soon as the barley had headed out it was cut for hay and removed from the land. By winter the clover had become firmly established and it promises to winter well.

Volunteer clover plants are now appearing in several parts of the farm where clover had been ploughed down many years ago. Alsike appears to be the most persistent variety. This year for the first time the Common Red clover gave a good yield of hay at the second cutting.

We find that pasturing clover during the fall months has a very injurious effect on the plants; for that reason a fenced field is the most suitable place for clover of all kinds.

The accompanying table gives this year's yield of the different varieties of clover. The soil was a sandy loam and the previous crop was barley. They were all sown on spring ploughed stubble, without a nurse crop. The weeds and volunteer crop was cut the first year when one foot high, and the cuttings left on the ground to act as a mulch.

Varieties.	When sown.	Seed per acre.	Thickness of Aftermath.	Yield of Hay per acre.	
		Lbs.		Tons.	Lbs.
Alsike and Timothy mixed	1902	15	Thin	2	1400
Mammoth Red Clover	1902	20	Fair	2	300
Alsike	1902	20	Thin	1	1200
Common Red Clover, 1st cutting	1902	20	Thick	1	600
" " 2nd "	1902	20	"	1	800
Alfalfa clover, 1st cutting	1902	25	"	1	1200
" 2nd "	1902	25	"	1	1200
" 1st "	1903	25	"	1	800
" 2nd "	1903	25	"	1	400
Common Red Clover, 1st cutting	1903	20	"	1	1600
" 2nd "	1903	20	"	1	1000
White Dutch	1902	20	Thin	..	1600

MILLETS.

As the land set apart for Millets was flooded, a trial was made of sowing them on wheat stubble land, ploughed in spring, and the result was very unsatisfactory. This plant requires a clean and compact soil, with a liberal supply of moisture; all of these requirements were lacking in the land used. The yield of hay was generally much below the average. Moha Hungarian was the only variety that gave a good return.

The size of the plots for this test were one-fortieth acre and the soil a sandy loam. All were sown on May 20 and cut on September 1.

Variety.	Height.	Stage when cut.	Yield of Hay per acre.	
	In.		Tons.	Lbs.
Moha Hungarian	45	Fully headed	6	....
Japan	40	Not headed	3	1600
Italian or Indian	35	"	2	1200
Common Millet	30	Fully headed	2	800
Algerian	65	Not headed	2	....
California	50	"	2	...
White Round French	55	Nearly ripe	..	1600
Pearl or Cat-tail	25	Not headed	..	600

CATTLE.

The herd of cattle on the experimental farm now consists of the following animals:—

Name of Animal.	Breed.	Age.	Weight.
			Lbs.
Alice May	Shorthorn	4 years	1,365
Nancy	"	4 "	1,210
Brandon Myrtle	"	5 "	1,435
Red Knight of Brandon	"	2 "	1,710
Rose of Brandon	"	18 months	890
Lily of Brandon	Ayrshire	2 years	1,145
Dentry	"	2 "	1,020
Haron	"	1 "	1,020
Brandon Maid	Guernsey	2 "	945
Ottawa Prince	"	2 "	1,480
Marie	"	8 months	470
Ruben	Shorthorn Grade	3 "	230
Christie	"	4 years	1,275
Gretchen	"	6 "	1,310
Carrie	"	7 "	1,465
Jennette	"	6 "	1,590
Jenney	"	15 months	530
Margaret	"	11 "	630
Daisy	"	6 "	330
Pet	Ayrshire Grade	5 years	920
Sis	"	17 months	655

MILKING COWS.

The accompanying table gives the length of the milking period and the weight of milk given by a number of the experimental farm cows for the past year:—

Name.	Age.	Breed.	Milking Period.	Pounds of Milk.
Nancy	4	Shorthorn	335 days ending Nov. 30, 1904	6,751
Brandon Myrtle	5	"	292 " "	5,219
Brandon Maid	2	Guernsey	268 " "	4,869
Christie	6	Shorthorn Grade	303 " "	9,241
Carrie	8	"	279 " "	6,934
Gretchen	5	"	267 " "	5,782
Pet	6	Ayrshire	138 " "	3,334

EXPERIMENTS IN FEEDING STEERS.

ONE-YEAR-OLD STEERS COMPARED WITH TWO-YEAR-OLDS.

The twelve steers selected for this test were apparently all shorthorn grades. Six of them were about 18 months old, the others 30 months. All were raised in the neighbourhood of Hamiota, Manitoba.

When purchased in November, 1903, the steers cost $3.25 per hundred pounds live weight and sold in May, 1904, for $4.25 per hundred pounds. The older steers were the most suitable for export purposes, but all were killed in Winnipeg, and the buyer gave the same price for each lot.

After two weeks of preparatory feeding they were divided into two groups, according to age.

All were tied in double stalls and fed all they would eat of the following ration:—

Ration per day for each one-year-old steer—

Corn fodder	15 lbs.
Oat straw	8 "
Corn ensilage	17 "
Swede turnips	10 "
Wheat bran	5 "
Ground grain	3 to 6 "

Ration per day for each two-year-old steer—

Corn fodder	15 lbs.
Oat straw	8 "
Corn ensilage	17 "
Swede turnips	10 "
Wheat bran	5 "
Ground grain	4 to 8 "

DESCRIPTION OF FODDER.

The fodder corn was Pearce's Prolific, cut when in the early milk stage, well cured in the stooks outside and drawn in as wanted. This was cut into one-inch lengths. The straw was mixed wheat and oat. The grain was composed of one-third each of barley, oats and wheat screenings, ground somewhat coarsely. The amount of grain fed was increased slightly each month until the test was completed.

COMPARATIVE GAINS.

One year old steers.	Date.	Weight.	Gain.	Total Gain.
Original weight of steers	Dec. 11, 1903	4,940 lbs.		
Weight at end of 1st term	Jan. 8, 1904	5,235 "	295 lbs.	
" 2nd "	Feb. 5, 1904	5,520 "	285 "	
" 3rd "	March 4, 1904	5,865 "	345 "	
" 4th "	April 1, 1904	6,092 "	227 "	1,152 lbs.

Two year old steers.	Date.	Weight.	Gain.	Total Gain.
Original weight of steers	Dec. 11, 1903	6,725 lbs.		
Weight at end of 1st term	Jan. 8, 1904	7,095 "	370 lbs.	
" 2nd "	Feb. 5, 1904	7,390 "	295 "	
" 3rd "	March 4, 1904	7,765 "	375 "	
" 4th "	April 1, 1904	7,895 "	130 "	1,170 lbs.

COST OF FEEDING.

One-year-old steers—

9,000 lbs. of fodder corn, at $4 per ton	$18 00
4,788 lbs. of straw, at $1 per ton	2 39
5,940 lbs. of turnips, at 5 cents per bushel	4 95
11,058 lbs. of ensilage, at $2 per ton	11 05
2,970 lbs. of bran, at $12 per ton	17 82
2,766 lbs. of chop, at 75c. per 100 lbs.	20 74
	$74 95

Two-year-old steers—

9,360 lbs. of fodder corn, at $4 per ton	$18 72
4,980 lbs. mixed straw, at $1 per ton	2 49
6,180 lbs. of turnips, at 5c. per bushel	5 05
11,466 lbs. of ensilage, at $2 per ton	11 46
3,090 lbs. bran, at $12 per ton	18 54
4,008 lbs, of chop, at 75c. per 100 lbs.	30 60
	$86 86

SUMMARY OF RESULTS.

—	First Cost of Steers.	Value of Feed Consumed.	Price per Steer sold for.	Gain per Day.	Profit per Steer.
	$ cts.	$ cts.	$ cts.	Lbs. Oz.	$ cts.
One year old steers	28 81	12 49	43 15	1 11	1 85
Two year old steers	39 22	14 47	55 92	1 11	2 23

CONCLUSIONS.

The results of this experiment would lead us to the following conclusions :—

First, the amount of gain in weight per day is the same with each lot of steers.

Second, the two-year-olds were slightly more profitable than the one-year-olds.

Third, the feeding of steers provides a ready market on the farm for rough fodder and inferior grain, but unless there is a greater difference than $1 per 100 lbs. between the buying price in the fall and the selling price in the spring, there is very little profit.

EXPERIMENTS WITH SWINE.

BARLEY COMPARED WITH MIXED GRAIN.

Barley is very productive in this country, and the six-rowed varieties can be sown late in the season, after all other seeding is finished, and still escape injury from frost. But few farmers, however, appear to use it extensively for pig feed.

Eight pigs were used for this test, all were cross-bred Berkshire and Tamworths.

The mixed grain used was one-third each of wheat, oats and barley; all the grain was ground coarsely.

Both kinds of feed were valued at 75c. per 100 lbs.

The pigs were purchased at $4 per 100 lbs. live weight, and sold at the close of the test at $5 per 100 lbs.

RATION FED.

Amount and value of food consumed during the fattening term of 70 days, from June 23 to September 1, 1904 :—

—	Grain fed.	Value of feed.
	Lbs.	$ cts.
Pen No. 1, fed barley alone	1,130	8 47
Pen No. 2, fed mixed grain	1,090	8 17

SUMMARY.

—	Weight when bought.	Value when bought.	Weight when sold.	Value when sold.	Value of food.	Profit on each pen.
	Lbs.	$ cts.	Lbs.	$ cts.	$ cts.	$ cts.
Pen 1, fed on barley..................	362	14 48	616	30 80	8 47	7 85
Pen 2, fed on mixed grain.	342	13 68	547	27 35	8 15	5 52

CONCLUSIONS.

First, the pen fed on barley consumed 40 lbs more grain during the fattening period than those fed on mixed grain.

Second, the same pen also made a gain of 49 lbs. more than those fed on mixed grain.

Third, the pen fed on barley made $2.33 more profit than the animals fed on mixed grain.

FEEDING PIGS ON PEASE IN THE FIELD.

Field pease give large returns in this province, but the one great obstacle to their general cultivation is the difficulty in harvesting and threshing the crop. With the object of overcoming this difficulty a trial was made of turning a number of pigs into one acre of nearly ripe pease and allowing them to do the harvesting and threshing.

Ten pigs were used for this test. They were all of mixed breeding and cost on September 3, $4.75 per hundred pounds, live weight, and sold on October 20 for $5 per hundred pounds. It was found necessary to ring them, otherwise they covered many of the pease in rooting up the soil.

The variety of pease used was Canadian Beauty, sown on one acre of summer-fallow land, on May 7. Pigs were turned into the field on September 3, and by October 20, they had all the grain eaten clean.

SUMMARY.

—	Weight when bought.	Value when bought.	Weight when sold.	Value when sold.	Profit on 1 acre peas fed to pigs
	Lbs.	$ cts.	Lbs.	$ cts.	$ cts.
Group of 10 pigs..............................	1,393	66 16	1,670	83 50	17 34

POULTRY.

Three breeds of poultry and their crosses have been kept during the year, namely: —White Wyandottes, Light Brahmas and Barred Plymouth Rocks.

All have kept quite healthy and seventy chicks were raised during the summer. A number of cockerels have been sold to farmers for breeding purposes. Plymouth Rocks are preferred for this purpose.

COMPARISON OF WHITE WYANDOTTES WITH BARRED PLYMOUTH ROCKS AS FATTENING FOWL.

This is a repetition of last year's test, but the comparison is not quite so favourable to the Plymouth Rocks as the previous test.

Four pure bred Barred Plymouth Rock cockerels and an equal number of White Wyandottes were shut up in slatted pens, each 2 x 3 feet, and fed all they would eat of finely ground grain, consisting of one-third each of wheat, oats and barley. This was given in troughs mixed with skim-milk to the consistency of thin porridge.

In the following tables the meal has been estimated at 75 cents per hundred pounds. The fattening period covered 21 days.

Wyandottes (White).

Weight Oct. 31.		Weight Nov. 21.		Gain.		Cost of Food.		Cost per lb. live weight.
Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	$	cts.	Cts.
20	6	25	8	5	2	0	18	3½

Barred Plymouth Rocks.

Weight Oct. 31.		Weight Nov. 21.		Gain.		Cost of Food.		Cost per lb. live weight.
Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	$	cts.	Cts.
20	1	26	1	6	0	0	19	3¼

INCUBATORS FOR HATCHING.

Owing to the late spring here it is difficult to obtain sitting hens early in the season. On this account chickens are often too late for early autumn killing, when prices are the highest. An effort has ben made to overcome this difficulty by using an incubator.

The incubator was filled for the first time last spring, on April 19, with 120 Plymouth Rock and Wyandotte eggs. Only 60 proved fertile, and 30 of these hatched. It was found impossible to obtain broody hens for a comparison in April.

On May 20 another lot of 120 eggs from the same fowls were started in the incubator, at the same time two broody hens were set on eggs from the same fowls. In each case two-thirds of the fertile eggs hatched.

All the chickens were raised in outside brooders and were equally strong, the loss after hatching being only four per cent.

CONCLUSION.

1st. The percentage of chickens from fertile eggs was the same, whether setting hens or incubator was used.

2nd. It is possible to secure earlier chickens by using an incubator.

3rd. A large proportion of the eggs laid in early spring before the fowls have an opportunity to take exercise are not fertile.

BEES.

Of the thirteen colonies of bees placed in the cellar in the fall of 1903, three late and weak colonies died during the winter.

All were removed from the cellar to their summer stands on April 5, as they appeared quite restless. The first pollen was gathered on April 28 from Anemone patens, commonly known as Wild Crocus; this was closely followed by Early Willow pollen.

The months of May and June were not favourable for gathering nectar, but as soon as July set in the bees worked very freely on wild flowers. Perhaps the largest supply was obtained from the Mint family of plants, which were unusually abundant this year, the honey from these plants was very thick, quite aromatic and agreeable to the taste.

Forty pounds of extracted honey was produced per colony, spring count, and eight new swarms obtained.

Bees have now been successfully kept on the farm for a number of years, and I see no reason why the average farmer should not succeed equally well, providing he is located near thickets of wood, where the bees can obtain ready access to abundance of native flowers, most of which secrete nectar, but out in the open prairie at a distance from timber, it may be more difficult to make a success of bee-keeping.

Parties supplied with colonies from this farm last year report having had good success with them.

HORTICULTURE, 1904.

The past season was in nearly every respect an ideal one for the horticulturist. April opened with bright sunny weather, which conditions were very favourable to the successful growing of plants in the hot-bed, and remarkably strong seedlings were ready at planting out time Perhaps the most gratifying feature in the climatic conditions is the continued absence of spring frosts. Formerly this was the most discouraging factor we had to contend with in horticultural work, resulting, as it frequently did, in the total destruction of the fruit blossoms, and seriously damaging such vegetables as cucumbers, squash, pumpkins, corn and tomatoes. For the past four years these frosts have not been in evidence, and it seems reasonable to hope that in this connection climatic conditions are permanently ameliorated. In the vegetable garden a bountiful crop was harvested. Continuing the practice established some years ago, a complete test was made of one or two kinds of vegetables, this year squash, pumpkins and onions being the vegetables selected.

Such extensive records as these must necessarily be of considerable value to the farmer and market gardener. The fruit crop was also a very satisfactory one. Cross bred apples and Siberian crab apples set heavily, and many varieties of considerable merit fruited for the first time. Plums also produced an abundant crop, among which were some of the best ever fruited on this farm. In the small fruits raspberries gave a very fair crop and showed much improvement over the product of previous years, due principally (in our opinion) to the mulch of green manure given them the preceding fall. Currants also set well, and a moderate crop of excellent quality was gathered, fuller particulars of which will be found under the heading of currants. In the Arboretum the trees have become so thick as render a generous thinning necessary, and a considerable amount of this work has been accomplished.

APPLES, 1904.

Last season again proved favourable for testing these fruits in Manitoba. The absence of spring frosts was followed by a heavy setting, and the somewhat open fall assisted in the ripening of some of the late varieties. The winter of 1903-4 was one of the most severe experienced here for some time past and some damage was occasioned by sun-scald. No permanent injury, however, was sustained, and by cutting off a few of the branches all traces of the trouble was removed. A large number of the varieties under test at the farm are rapidly coming into bearing condition, and each year shows a decided progress in this important branch of work.

STANDARD APPLES.

The following varieties of standard apples, root grafted on *Pyrus baccata*, together with some Russian seedlings, were received from the Central Experimental Farm at Ottawa, in the spring of 1903. The following table shows their condition after having passed through one winter:—

Variety.	Trees No.	Condition 1904.
Hibernal	3	1. Killed back one quarter 1903-4; strong growth 1904.
		2. Wintered well 1903-4; strong growth 1904.
		3. " " "
Wealthy	3	1. Killed to near ground 1903-4; strong growth 1904.
		2. Killed to ground 1903:4; strong growth 1904.
		3. Killed back one-quarter 1903-4; fair growth 1904.
North-western Greening	2	1. Killed to ground 1903-04; strong growth.
		2. Died 1903-4.
McMahon White	3	1. Killed back slightly 1903-04; fair growth 1904.
		2. " " " "
		3. Killed back one-quarter 1903-4; strong growth 1904.
Longfield	2	1. " " fair growth 1904.
		2. " " strong growth 1904.
Yellow Transparent	3	1. Killed to ground 1903-4; strong growth 1904.
		2. " " fair growth 1904.
		3. " " strong growth 1904.
Pointed Pipka	3	1. Killed back slightly 1903-04; strong growth 1904.
		2. Killed to near ground 1903-04, strong growth 1904.
		3. Killed to ground 1903-4; fair growth 1904.
Duchess of Oldenburgh	3	1. Killed back one-quarter 1903-4; fair growth 1904.
		2. Killed to ground 1903-4; strong growth 1904.
		3. Wintered fairly well 1903-4; very weak growth 1904.
Scott's Winter	3	1. Died 1903-4.
		2. Killed to ground 1903-4; fair growth 1904.
		3. " " weak growth 1904.
McIntosh Red	2	1. Killed back one-quarter 1903-4; strong growth 1904.
		2. Killed to near ground 1903-4; fair growth 1904.
Russian Seedling No. 3	2	1. Killed back slightly 1903-4; fair growth 1904.
		2. Wintered well 1903-04; strong growth 1904.
Russian Seedling No. 7	2	1. " " "
		2. " " "
Russian Seedling No. 18	3	1. Killed back slightly 1903-04; fair growth 1904.
		2. " " strong growth 1904.
		3. Wintered well 1903-4; strong growth 1904.
Russian Seedling No. 22	3	1. Killed back slightly 1903-4; strong growth 1904.
		2. Killed to ground 1903-4; fair growth 1904.
		3. Killed to near ground 1903-4; strong growth 1904.
Russian Seedling No. 26	1	1. Killed to ground 1904; strong growth 1904.

Scions of the following standard apples were received from the Central Experimental Farm in 1903, and were top grafted on *Pyrus baccata* in the orchard south of the barn: Patten's Greening, Duchess, Yellow Transparent, McMahon White, Wealthy, Longfield, Charlamoff, Malinda, North-western Greening, Hibernal. These were all dead in the spring of 1904.

A number of scions of named cross-bred apples were received from the Central Farm for the same purpose. The following table shows their condition:—

Variety.	Condition 1904.	
Aurora	Killed back slightly, 1903-04.	Strong growth, 1904.
Carleton	" " "	" " "
Ruby	Received, 1904.	Fair. " "
No. 218	" "	" " "
Pioneer	Wintered well, 1903-04.	Strong " "
Derby	" "	" " "
Northern Queen	" "	" " "
Rideau	Received, 1904.	Fair " "
Alberta	" failed to unite.	
Jewel	"	Weak " "
Elsa	" did not take.	
Novelty	Wintered well, 1903-04.	Strong " "
Columbus	Received, 1904.	" " "
Tony	" "	" " "

THE WEALTHY APPLE.

In previous reports mention has been made of the hardiness of an apple received from Mr. A. P. Stevenson, of Nelson, as the Wealthy. Although this tree has fruited for one or two years past, the fruit has been stolen before it approached maturity, consequently we could not verify the correctness of the name.

From specimens grown this season it is evident that it has been mis-named, as the fruit is much too small for Wealthy, and lacks all other characteristics of that variety. It is probably one of the larger crab apples.

DUCHESS OF OLDENBURGH.

Some scions of this variety were received from H. L. Patmore, a local nurseryman, in 1902, and were top grafted on Pyrus baccata. A portion of these were used in the Pyrus orchard south of the barn, and the balance were put on to a single specimen of *Pyrus baccata* growing on the hillside. The spring following, all in the south orchard were entirely killed, while those on the hillside were perfectly sound. The latter has continued hardy, and a few flowers were produced last spring, though not in sufficient quantity to ensure a set. Should this hardiness prove permanent a valuable addition will be made to our list of apples.

CROSS NO. 179.

In the hillside cross-bred orchard under the above number there fruited the past season the largest apple yet grown on the experimental farm. Though the tree is quite small it bore 15 fruits nearly as large as the Wealthy apple, of good colour and flavour, and which ripened early. The tree in question is planted in a very exposed position, and appears to be reasonably hardy. The identity of the cross has not yet been established.

CROSS-BRED SEEDLINGS, 1904.

A large number of cross-bred seedlings fruited for the first time this season, many of which were very promising. All of these show a very marked improvement over Pyrus baccata, the pistillate parent, and would be gladly welcomed by the farmers of Manitoba and the North-west. The most promising of these crosses yet fruited are:—

Pyrus baccata x Wealthy.	Pyrus baccata x Beautiful Arcade.
" x Tetofsky.	" x Krimskoe.

The Beautiful Arcade cross, though one of the smallest in size, is entirely free from astringency and has a fine aromatic flavour.

SEEDLING OF TRANSCENDENT.

One of the seedlings of the Transcendent fruited during the past season for the first time. The fruit was handsome in appearance, and considerably larger than the parent variety, and much was expected from it. A test of its flavour when ripe, however, speedily dissipated our hopes, as it proved to be excessively astringent, and with hollow core.

SEEDLINGS OF MARTHA CRAB.

These seedlings, which have been referred to in previous reports, are likely to prove one of the most satisfactory additions to the collection of apples. A number of them came into bearing for the first time this year, and, in some a marked improvement was shown over those which have fruited in the past. Two of them were superior to the 'Transcendent' crab, both in size and flavour. The best of them have been named and will be propagated so as to admit of a more general test.

SEEDLINGS OF THE SNYDER CRAB.

Two seedlings of the Snyder crab fruited the past season, both of considerable merit. The fruit though somewhat small in size, was of excellent flavour and made a capital preserve. Most of the seedlings of Snyder have proved tender, but these are promising for hardiness.

TONKA CRAB.

This variety still continues hardy and the original tree from which our scions were obtained again fruited the past season, but by reason of its out-of-the-way location and the consequent difficulty of protecting it the fruit was again stolen before it had gained maturity. A sufficient number of trees have been grafted, however, to perpetuate the variety, some of which show promise of fruit next season. As these are in a fenced orchard, we will doubtless have an opportunity of testing the mature product before long.

TRANSCENDENT CRAB.

Several of the trees in the Pyrus orchard have been top-grafted with the Transcendent crab and have now passed through three winters. So far they have proven quite hardy, and this season some of them fruited for the first time. The fruit was of good size and entirely free from blemish. This is encouraging, as not many years ago we found it difficult to winter the Transcendent. Probably much of the success of the experiment is due to the splendid stock of the Pyrus baccata, the hardy Siberian crab introduced by the experimental farms.

PRIDE OF MINNEAPOLIS.

Scions of this variety were received from H. L. Patmore in 1902, and top-grafted on Pyrus baccata. Though spoken of highly, we do not see very much to recommend it, judging by the fruit produced this year. It is thoroughly hardy, is very late, and of poor flavour, and not equal to the Transcendent crab in size.

PYRUS BACCATA.

A very heavy crop of fruit was again harvested from this variety, many of the trees producing quite large fruit of fair flavour.

PLUMS.

We have again the pleasure of recording a very heavy crop of this fruit at the Brandon farm, the majority of the trees being so heavily laden as to weigh the branches to the ground. The most interesting feature, however, was the fruiting for the first time of three native varieties, superior to anything we have yet noted, both in earliness and flavour. Three trees, received from Mr. M. Major, of Winnipeg, ripened their fruit early in August, fully two weeks earlier than any other trees on the farm. The product was of comparatively large size, deep red in colour when ripe, the skin very sweet and juicy, with no signs of astringency, while the stone was not out of proportion to the flesh (a serious drawback to many of the types under test.) The first fruit of all three trees was nearly identical, and consequently we have given them the same name, viz,, 'Major.' Another tree of exceptional merit was received from the Souris district, and though not quite equal to the former, is well worthy of propagation, and has been given the name of 'Souris.' The last one worthy of special mention is the only yellow variety yet fruited at the experimental farm. When ripe, this is a light yellow in colour, with a few faint reddish dots on the sunny side. The flavour is quite distinct, very sweet and this plum has been named 'Brandon.'

The first of these varieties is greatly superior to the average native plum and is delicious either as dessert or for preserving. Of the seedlings of the American plum (Prunus Americana) only those of 'Cheney' have been found satisfactory, none of the others ripening early enough, and the larger portion of these late varieties have been removed to make room for more promising specimens. A quantity of seed was gathered from the earliest and best native trees, was sown this fall, and it is hoped that a sufficient number of seedlings will be obtained to plant out a considerable area, so that further selection may be made.

CURRANTS.

A large number of varieties of this fruit was received from the Central Experimental Farm in the spring of 1902. All became well established, and during the past

season produced a sufficient crop of fruit to warrant comparisons. Just as the fruit commenced to ripen the currant worm appeared and threatened to defoliate the bushes, but a timely application of white hellebore, one or two ounces to a pailful of water, applied with a spray pump, quickly stopped their depredations, and no serious damage resulted. Following will be found the names of the varieties under test, together with notes on the same :—

CURRANTS, 1904.

Variety.	Colour.	Flavour.	Length of Spike.	Fruit on Spike.	Weight from one Tree.
			In.		Lbs.
White Imperial	White	Slightly acid	$2\frac{1}{4}$	Thicklyset	$2\frac{1}{4}$
Climax	"	Sweet	2	"	$1\frac{1}{4}$
Large White	"	"	$2\frac{1}{4}$	"	$1\frac{3}{4}$
Defiance	Red	"	2	"	$1\frac{3}{4}$
Houghton Castle	"	"	$2\frac{1}{2}$	"	$1\frac{1}{2}$
Giant Red	"	Fairly sweet	$2\frac{1}{2}$	"	$3\frac{1}{4}$
Verrier's White	White	Very fine	3	Thinly	$2\frac{1}{4}$
White Grape	"	Slightly acid	$2\frac{1}{2}$	Thicklyset	$1\frac{1}{2}$
White Kaiser	"	Sweet	$2\frac{1}{4}$	"	$1\frac{1}{16}$
Mattie	Black	" thin skin	2	"	$1\frac{1}{16}$
White Cherry	White	"	$2\frac{1}{4}$	"	$2\frac{1}{2}$
Star	Black	Fairly sweet and juicy, thickish skin			$1\frac{1}{4}$
Eagle	"	Sub-acid and juicy, thick skin			$1\frac{1}{2}$
Black Grape	"	Fairly sweet and dry, thin skin			$1\frac{1}{4}$
Black English	"	" juicy, thin skin			$1\frac{1}{4}$
Kentish Hero	"	Sub-acid and juicy, thickish skin			$1\frac{3}{4}$
Merveille de Gironde	"	" " thin skin			$2\frac{3}{4}$
Stirling	"	Sweet and juicy, thin skin			$2\frac{1}{2}$
London Red	Red	"	$2\frac{1}{4}$	Thicklyset	$1\frac{1}{2}$
Lewis	"	"	2	Thinly "	$1\frac{1}{16}$
Dominion	Black	Sub-acid, not juicy ; skin moderately thick			$1\frac{1}{2}$
Beauty	"	Sweet and juicy, thickish skin			$1\frac{5}{16}$
Baldwin's Black	"	Sub-acid and juicy, thick skin			$2\frac{3}{4}$
Winona	"	Sweet and dry, thin skin			$1\frac{1}{16}$
Standard	"	" thick skin			$2\frac{1}{2}$
Ethel	"	Fairly sweet and juicy, thin skin			$1\frac{3}{4}$
Oxford	"	Sweet and juicy, thin skin			$1\frac{1}{4}$
Brandenburg Black	"	" " thickish skin			$1\frac{1}{16}$
Wilder	Red	Fairly sweet	$2\frac{1}{2}$	Thinly set	$1\frac{1}{4}$
White Dutch	White	"	$2\frac{1}{2}$	"	$1\frac{1}{4}$
Eclipse	Black	Sweet, thin skin			$1\frac{1}{4}$
Orton	"	Sweet and juicy, thin skin			$1\frac{1}{8}$
Prince of Wales	"	Fairly sweet and juicy, thin skin			$1\frac{1}{8}$
Stewart	"	Slightly acid, thin skin			$1\frac{1}{2}$
Gewohnliche	"	Fairly sweet and dry, thin skin			$1\frac{1}{4}$
Clipper	"	" " "			$1\frac{1}{16}$
Percy	"	Sweet and juicy, thick skin			$1\frac{1}{4}$
North Star	Red	"	$2\frac{1}{4}$	Thicklyset	$2\frac{1}{4}$
Moore's Seedling	"	"	$2\frac{1}{2}$	"	$2\frac{3}{4}$
Cumber	"	Extremely acid	$2\frac{3}{4}$	"	$2\frac{3}{4}$
Fertile D'Angers	"	Sub-acid and juicy	$2\frac{1}{4}$	"	$1\frac{1}{4}$
Simcoe Red	"	Acid and juicy	2	Thinly set	$3\frac{1}{4}$
Pomona	"	Sweet and juicy	$2\frac{1}{2}$	Thicklyset	$2\frac{3}{4}$
Prince Albert	"	"	3	Thinly set	2
Early Scarlet	"	Sweet and dry	2	"	$1\frac{1}{16}$
Frauendorfer	"	Slightly acid	$2\frac{1}{2}$	"	$1\frac{1}{16}$
Red Grape	"	Sweet and juicy	2	Thicklyset	$1\frac{1}{2}$
Long Bunch Holland	"	"	2	"	$1\frac{1}{4}$
Rankin's Red	"	"	2	"	$1\frac{1}{4}$
Red Dutch	"	"	2	"	3
La Conde	"	"	2	"	$1\frac{1}{4}$
Fay's Prolific	"	"	$1\frac{3}{4}$	Thinly set	$1\frac{1}{8}$
New Red Dutch	"	"	$1\frac{3}{4}$	Thicklyset	$2\frac{1}{8}$
Admirable	White	"	$2\frac{1}{2}$	"	$2\frac{1}{4}$
Goliath	Red	"	$1\frac{1}{2}$	"	$1\frac{1}{4}$
Versailles	"	"	$1\frac{3}{4}$	"	2

GOOSEBERRIES.

Twenty-five varieties of gooseberries were received from the Central Experimental Farm, Ottawa, and planted here on April 22, 1903. Nearly all of these survived the winter of 1903-4, and only a slight amount of winter-killing was noticeable. The plants being quite small, only one variety fruited this year, viz.: the Downing. The fruit of this was quite large, of an elongated shape, and with a perfectly smooth skin. The flavour was excellent.

RASPBERRIES.

The raspberry crop this season was much superior to that of recent years, and it may be that much of this improvement may be attributed to the following cause: For some time past it has been customary here when laying down the canes in the fall of the year for winter protection to use a plough for throwing a furrow over the tips of the canes. Though this method was effective in so far as protection was concerned, it appeared to seriously injure the fibrous roots which are so near the surface, and the following year the canes showed a more or less stunted growth. Two years ago this mode of operation was changed by pressing the canes flat with a long scantling and throwing green manure over the tips. This has resulted in a great improvement in both canes and fruit as compared with the old method, and, as the strawy manure is left on the ground during the ensuing summer, it acts as a mulch, conserving the moisture, and adding in no small degree to the success of the experiment.

STRAWBERRIES, 1904.

A number of plants of the Alpine ever-bearing strawberry were received from the Central Experimental Farm in the spring, and all were quite vigorous before winter set in. Though not as large as the standard varieties these are extremely hardy, and continue their fruit production throughout the entire season, which should make them specially valuable for Manitoba and the North-west.

HEDGES, 1904.

All the small test hedges on the farm continue to do well, one composed of the native Buffalo berry (*Shepherdia argentea*) calling forth much favourable comment from visitors. This hedge is now about 5 feet in height, and is very compact and symmetrical, lending itself readily to the pruning shears, and as it produces thorns abundantly it is almost impenetrable.

The shelter blocks in the south-west corner of the farm surrounded by double maple hedges having become too crowded, every alternate hedge was cut out during the past season, thus reducing the number of blocks about one-half, and giving increased space for planting.

FALL SOWING AS COMPARED WITH SPRING SOWING OF CARAGANA ARBORESCENS.

Until last year, we have invariably sown the seed of this desirable shrub in the spring, but an experiment was made during the fall of 1903 to ascertain if any advantage accrued from fall sowing. A number of drills were sown in the fall of 1903, and sufficient space left alongside for a duplicate sowing the spring following. The results point strongly to the advisability of fall sowing; the plants from the fall sown seed averaging 6 inches taller than those from the spring sown seed, and showing a much greater vigour.

EXPERIMENTS IN COVERING TENDER SHRUBS FOR WINTER PROTECTION, PHILADELPHUS (MOCK ORANGE.)

Mention was made on page 344 of last year's report of experiments made to ascertain the possibility of flowering this beautiful, but tender shrub, by means of winter protection. During the fall of 1903 a further test was made, the following varieties being included:—

Seedling of Martha Crab, at the Experimental Farm, Brandon, Man., 1904.

Philadelphus grandiflorus. *Philadelphus deutziaflorus.*
" *coronarius.* " *inodorus.*

The branches were bent to the ground and sufficient soil was thrown over the tips to retain them in that position. The result was entirely satisfactory, as all varieties flowered, *P. grandiflorus* and *P. deutziaflorus* very heavily. As there are many of these half-hardy shrubs, the branches of which kill-back more or less each winter, it would seem well worth while to go to this small amount of labour in order to secure flowers. This test was continued on a larger scale this year, and many other tender varieties were covered, the material used being fresh manure, and the results will be reported on next season.

ARBORETUM, 1904.

Very little addition was made to the Arboretum during the past season, the principal portion of the work done being a generous thinning in portions of the plantation which were becoming crowded. Three trees of Populus Simoni were received from H. L. Patmore, nurseryman, Brandon, two of which were living on the approach of winter.

VEGETABLE GARDEN.

ONIONS, 1904.

Thirty-eight varieties of onions were sown in the open on April 28 with Planet Jr. hand drill, in drills 16 inches apart. Although 12 inches apart is the usual distance recommended for this vegetable, we have found that 16 inches is preferable, as with the former distance the rows are too crowded to admit of easy cultivation. A gratifying feature in this test was the uniform germination, there being only two varieties whose germinating power was so low as to not admit of comparisons being made. About a month previous to pulling, the tops were pressed down to the ground, which greatly facilitated ripening, and when they were pulled on September 3, a large number of them were nearly ripe. They were brought inside on September 17, and after lying on the barn floor a week or two, were in good condition for storing. Several of the Italian varieties, though producing large bulbs, do not seem desirable for cultivation here as they lack firmness, and have a loose skin, which would detract form their keeping properties. *Red Madeira* appears to be one of the 'bunching' varieties only suitable for use in countries where they are able to stand the winter, and where they are used as spring onions. Of the pickling varieties *Adriatic Barletta* again proved its superiority, giving the largest percentage of suitable bulbs for this purpose. In connection with this vegetable we would again call attention to the necessity of early sowing. Various complaints have been received here, in regard to the non-ripening of onions, and inquiry has usually disclosed the fact, that the sowing was done too late.

It is important that sowing take place as soon as the soil is in condition in the spring, in fact if a situation is available which is protected from the spring wash, fall sowing may be employed to advantage, as by this means the earliest possible germination is secured. The following list contains the most suitable varieties for cultivation in this province.

1. Extra Early Flat Red.
2. Giant Yellow Globe.
3. Prize Taker Yellow.
4. Red Wethersfield.
5. Yellow Globe Danvers.
6. Southport Yellow Globe.
7. Early Red Globe.
8. Yellow Cracker.
9. Southport Red Globe.
10. Australian Brown.
11. Michigan Yellow Globe.
12. Early Flat Danvers.
13. Australian Yellow Globe.
14. Adriatic White Barletta.

Following will be found the result of the test arranged in order of productiveness:—

ONIONS—TEST OF VARIETIES.

Variety.	Colour.	Shape.	Ripeness.	Size.	Yield per Acre.	Remarks.
					Bush.	
Giant Brown Rocca	Reddish brown..	Globular..	Nearly ripe.	Large	641	Rather late for Manitoba.
White Tripoli	White..........	Flat......	Not ripe....	"	591	Not suitable for storing.
Mammoth Pompeii..	Deep red.......	"	Nearly ripe.	"	580	Not specially desirable.
Mammoth Silver King.	White.......	Flattish ..	" " .	Med. to large.	563	Not desirable variety.
Prize Taker Yellow.	Deep yellow....	Globular..	Fully " .	" " ..	549	A good onion.
Red Tripoli	Light red	" ..	Nearly " .	" " ..	527	Rather late for Manitoba.
Southport Red Globe	"	" ..	Fully " .	Medium ...	500	A desirable variety.
Early Red Globe....	Deep red........	" ..	" " .	Small to med..	492	A good early variety.
Trebon's Large Yellow.	Pale yellow.....	" ..	" " .	Medium	488	A fine keeper.
Gibraltar	Light "	" ..	Nearly " .	Med. to large..	477	A promising variety.
Prize Taker Red Globe.	Medium red....	" ..	Fully " .	Medium	475	A first class variety.
Giant Yellow Rocca	" yellow .	" ..	Not " .	"	463	Too late for Manitoba.
Southport Yellow Globe.	Deep " .	" ..	Fully " .	Med. to large..	450	An excellent var. for Manitoba.
Red Wethersfield...	" red........	Flattish ..	" " .	" " ..	429	A first class variety.
Giant Yellow Globe.	" yellow.....	Globular..	" " .	Medium......	419	A good early variety.
Yellow Globe Danvers.	" "	" ..	" " .	Med. to large..	418	A standard variety.
Spanish King..	Yellow.........	Flattish ..	Nearly " .	Medium......	409	Rather late for Manitoba.
Extra Early Flat Red.	Bright red	" ..	Fully " .	Med. to small.	407	A very early variety.
Red Bassano	Deep "	" ..	Nearly " .	Medium	401	Rather late for Manitoba.
Golden Pheasant ...	" yellow.....	" ..	Fully " .	"	392	A new variety of considerable merit.
Yellow Globe Danvers.	" "	Globular..	" " .	"	379	Good early variety.
White Portugal.....	White..........	Flattish ..	Not " .	"	375	Not a desirable variety.
Australian Brown ..	Reddish brown..	Globular..	Fully " .	"	363	A good early variety.
Northland..........	Deep yellow....	Flattish ..	" " .	"	353	" "
Yellow Cracker.....	" "	" ..	" " .	"	314	" "
Michigan Yellow Globe.	" "	Globular..	" " .	Med. to large..	298	A first class variety.
Market Favorite Keeping.	Brown yellow...	Flattish ..	" " .	Medium......	291	A good keeper.
Round Hard Dutch.	White	Flat......	" " .	Small to med..	291	Poor as pickler or large onion.
Australian Yellow Globe.	Deep yellow	Globular..	" " .	" " ..	291	Very badly mixed.
Red Madeira.......	Very light pink.	" ..	Not " .	Med. to large..	200	Late and very thick-necked.
Paris Silver Skin....	White..........	Flat......	Fully " .	Small to med..	183	Too many large tubers.
Small Barletta......	"	"	" " .	Small	175	A first class pickler.
Small Silver Skin...	"	"	" " .	"	163	Of only fair quality.
White Queen.....	"	"	" " .	Small to v. sm.	161	Poor as pickler or large onion.
White Maggiagola..	"	"	" " .	" to med.	156	Too many large bulbs.
Early Flat Danvers	Deep yellow....	Flattish ..	" " .	Medium......	84	Germination too poor for proper comparison.

Red Welsh, light red, of no value except a bunching onion (no bulbs formed).

ONION (SETS) 1904.

The following varieties of onion sets were tested during the past season :—

Yellow Dutch sets,	Shallots sets
English Multiplier sets,	Top of Button sets,
White Multiplier sets,	Garlic sets.

These were planted in the open on April 28, and all produced a good crop. Yellow Dutch sets are by far the most useful, as they usually give heavy returns and ripen very early. The Shallot is an excellent keeper, though small in size, and is much in demand here. The White Multiplier would be satisfactory for pickling purposes, but does not equal the seed onions for this purpose, and is a poor cropper.

SQUASH AND PUMPKIN.

Thirty-seven varieties of squash and pumpkin were sown in the open on May 23, 1904, and nearly all germinated well. As usual, a heavy crop was harvested, many of the varieties ripening. A number of complaints are received from growers throughout the province in regard to their inability to grow this vegetable satisfactorily, and we have deemed it advisable to mention one very important factor in the successful cultivation of this class of vegetables.

Squash and pumpkins produce the male and female flowers separately on the same plant, and in order to ensure the setting of the fruit, it is necessary that the pollen from the male flower should be brought into contact with the female flower. When there are bees in the immediate vicinity, this operation is accomplished most thoroughly by their agency, but in the absence of these insects hand pollination is sometimes necessary. The process is extremely simple and consists in removing the male or staminate flower as soon as it is fully open, and transferring it to the female or pistillate flower, which latter is readily distinguished by the immature fruit at its base. When the vines have attained a moderate length, the ends of the runners should be nipped off. This brings several flowers of both sexes into bloom simultaneously, allowing fertilization to be accomplished. If this measure is adopted, growers are likely to have much better success. The following varieties proved most suitable for Manitoba :—

PUMPKINS.

1. *Sweet or Sugar.*—A small variety of excellent flavour and texture, ripening early, and excellent for pie purposes.

2. *Japanese Pie.*—Somewhat similar to the foregoing.

3. *Winter Luxury.*—A medium sized variety, light yellow in colour, densely netted and resembling a large musk melon. Fairly early and of fine texture.

4. *Connecticut Field.*—A large yellow variety generally grown for feed purposes, but also makes a good pie, early and very productive.

Mammoth Tours.—This was the largest variety grown this season, and would be useful for feed purposes.

SQUASH.

English Vegetable Marrow.—A standard variety. Productive and early and one of the best for use as a vegetable.

Long White Bush Marrow.—A bush form of vegetable marrow. Early and productive and resembling the English vegetable marrow in texture and flavour.

Extra Early Orange Marrow.—This variety still holds its position as the best variety for Manitoba. It is quite equal to a pumpkin for pie purposes, very early and productive and a splendid keeper.

The results of this test were as follows :—

SQUASH AND PUMPKINS—TEST OF VARIETIES.

No.	Variety.	Colour.	Texture and Flavour.	Ripeness.	Average Weight.
1	Connecticut Field	Deep yellow	Poor feed	90 p. c. ripe	28 pounds.
2	Golden Oblong	"	Fair	25 "	6 "
3	Grey Mammoth	Greyish green	For feed	50 "	28 "
4	Japanese Pie		Very good	80 "	8 "
5	Large Cheese	Deep yellow	Somewhat coarse	90 "	18 "
6	Mammoth Tours	Grey and green	For feed	75 "	35 "
7	Negro	Deep yellow	Fair	5 "	7 "
8	Red Etampes	Reddish yellow	Very good	5 "	5½ "
9	Striped Custard		Did not nearly approach maturity.		
10	Sweet or Sugar	Deep yellow	Very good	85 "	6 "
11	Tennessee Sweet Potato		Did not nearly approach maturity.		
12	Winter Luxury	Light yellow	Very good	75 "	10 "
13	Bay State (Squash)	Greyish green	Not ripe	Not ripe	10 "
14	Boston Marrow		Did not nearly approach maturity.		
15	Brazillian Sugar	Light yellow	Not ripe	"	7 "
16	Canadian Crookneck	Dark green	"	"	5 "
17	Cocozelle	Green white	Very good	50 p. c. ripe	9 "
18	Delicata (Squash)	Light yellow	"	5 "	11 "
19	Early Golden Bush	"	Poor	10 "	4 "
20	Early Golden Bush	"	"	50 "	3½ "
21	English Vegetable Marrow	Yellowish white	Very good	90 "	8 "
22	Essex Hybrid (Squash)	Terra cotta	Fair	10 "	10 "
23	Ex. Early Orange Marrow	Reddish yellow	Very good	95 "	7 "
24	Faxon (Squash)	Light "	"	10 "	11 "
25	Fordhook (Squash)	Dark green	Not ripe	Not ripe	7½ "
26	Golden Hubbard	" yellow	Very good	5 p. c. ripe	7 "
27	Hubbard (Squash)	" green	"	A few ripe	11 "
28	Long White Bush Marrow (Squash)	Yellowish white	"	90 p. c. ripe	9 "
29	Long Island Bush (Squash)	" "	"	50 "	3½ "
30	Marblehead "	Green and white	Not ripe	None ripe	8 "
31	Mammoth Whale "	Light green	For feed	75 p. c. ripe	27 "
32	Pikes Peak "	Green and white	Very good	Nearly ripe	9 "
33	Summer Crookneck "	Light yellow	Poor	50 p. c. ripe	3 "
34	Turban "	Terra cotta	Very good	65 "	11 "
35	Warty Hubbard	Dark green	"	A few ripe	8 "
36	Warren	Light yellow	"	10 p. c. ripe	14 "
37	White Bush Scallop	White	"	75 "	4 "

CUCUMBERS.

Nine varieties of cucumbers were sown in the open on May 23, 1904, in hills 5 feet apart each way, and as usual a very heavy crop of fruit was harvested before frost. Following is the result of the test arranged in order of earliness :—

Variety.	Germination.	Average Weight.	Productiveness.	Average Length.
		Ounces.		Inches.
Early Frame	Very good	4	Very productive	6
Early Green Cluster	"	4	" "	6
Chicago Pickling	Good	8	Moderately prod'tive	8
Green Gherkin	"	3½	" "	4
Cumberland	Fair	12	Very "	10
Early White Spine	Good	9	Not "	9
Improved Long Green	"	10	" "	9
S. B. Evergreen	Poor	9	Fairly "	8
McKenzie's Prolific	Not one seed germinated.			

N.B.—Early Frame, Early Green Cluster, Paris Pickling and Cumberland were the cream of the varieties tested.

CABBAGE, 1904.

Ten varieties of cabbage were sown in cold frame on April 21, and set out in the open on May 31. With two exceptions the germination was exceptionally good and a heavy crop was harvested. Following will be found a list of varieties tested, together with average weights of heads, arranged in order of earliness :—

Variety.	Germination.	Weight.	Shape.
		Lbs.	
Paris Market	Good	7¾	Conical.
Extra Early Express	"	6¾	"
Early Enfield	Fair	6	"
Early Jersey Wakefield	Good	7½	"
Midsummer Savoy	"	6	Flattish.
Early Winningstadt	"	10	Conical.
Fottler's Drumhead	"	29	Flat.
Red Drumhead	"	12	"
Green Globe Savoy	"	8	Flattish.
Superb Dwarf Imperial	Did not germinate.		

GARDEN PEASE, 1904.

Seven varieties of garden pease were sown in the open on May 10, in double rows 3 feet apart. With one exception the germination was good, and a splendid crop was harvested. All varieties ripening their seed.

Following is the result arranged in order of earliness:—

Variety.	Length of pod.	Number of peas.	Flavor.	Productiveness.
S. & B. Extra Early	2¼ in.	5 to 6	Fair	Mod. productive.
Extra Early Manifold	2¾ "	5 " 6	Good	Very productive.
Gradus	4¼ "	8 " 9	Very good	Not "
American Wonder	2¾ "	5 " 6	Good	Very "
Yorkshire Hero	4¼ "	7 " 8	Very good	Fairly "
Improved Stratagem	4½	8 " 9	"	" "
Extra Early Leviathan	Did not ger	minate.		

We would again call special attention to the variety *Gradus*. This is beyond question the earliest large pea yet tested here. The pods are long, and well filled with pease of large size and exceptional quality, and though not a productive variety, the qualities of earliness and flavour which it possesses, make it well worthy of a place in the garden.

TOMATOES.

Four varieties of tomatoes were sown in boxes in hot-bed on April 8, 1904, and after transplanting were transferred to the open ground on June 8, 1904. The varieties represented were, Simmers' Earliest, Red Currant, Sparks' Earliana and Earliana. All produced some ripe fruit, there being comparatively little difference between the two Earliana's either in productiveness or earliness, both of them were earlier ripening than Simmers' Earliest. The Red Currant tomato is a small fruited variety, producing its fruit in long bunches, similar to the Currant, and is of fine flavour, making a capital

preserve. It has also the merit of earliness. The Earliana seems to be the variety best suited to north-western conditions.

TOBACCO, 1904.

Six varieties of tobacco were grown during the past season. The seed was sown in boxes in the hot-bed on April 15, and after transplanting, the plants were set out in the open on June 15, and were especially strong and vigorous. Despite the somewhat cool season, the product attained a greater degree of maturity than in any previous tests, and it seems quite probable that we may yet succeed in growing tobacco satisfactorily in Manitoba. The plants were set out in rows 3 feet apart, and 3 feet apart in the row. During the summer the flowers were pinched off as fast as they appeared, all suckers were removed, and beyond some damage occasioned by heavy winds, the leaves were nearly perfect.

Following are the leaf measurements of the different varieties under test, together with the stage of ripeness reached.

No. 1. White Burley.—Dimensions of leaf: Length, 2 feet 5 inches; breadth, 16 inches. Commencing to colour.

No. 2. Small Red Canadian.—Dimensions of leaf : Length, 26 inches ; breadth, 17 inches. Commencing to colour.

No. 3. Primus.—Dimensions of leaf : Length, 26 inches ; breadth, 15 inches. Quite immature.

No. 4. Connecticut.—Dimensions of leaf: Length, 28 inches; breadth, 14½ inches. Quite immature.

No. 5. Simmers' Spanish.—Dimensions of leaf: Length, 24 inches; breadth, 12 inches.

No. 6. Quesnel.—Dimensions of leaf: Length, 16 inches; breadth, 12 inches.
Nearly ripe. The earliest of all tested.

It will be seen from the above that the most promising varieties for Manitoba of those tested are: Quesnel, White Burley and Small Red Canadian.

FLOWER GARDEN.

With the overflowing of the Assiniboine river the past spring, and the consequent flooding of the site of our annual flower garden, the prospects for a floral display did not seem at all promising in the early part of the season. After the water receded, the soil was sour, owing to the length of time it had been covered, and it did not seem possible for plants to thrive in it. However, the bed was given a thorough digging, fully two spades deep, and left in a rough condition for a week or ten days in order to give it an opportunity for mellowing. At the expiration of this time a thorough raking was given and the seedlings were planted. The plants grew luxuriantly and flowered profusely, the garden being fully as attractive as in previous years. The following annuals may be of interest :—

Abronia umbellata.—A pretty little trailer of easy cultivation and producing compact little trusses of pink flowers profusely.

Barlonia Aurea.—This was one of the most satisfactory annuals ever grown here. The large bright yellow flowers are produced very abundantly, a single plant covering a space three feet square. Hardy and easy of cultivation.

Nemophila maculata.—A pretty little annual, very dwarf and compact in habit, flowering freely. The colour of the flowers being a very light blue with a dark blue blotch at the base of each petal. Seems to prefer a shady situation.

Phacelia grandiflora.—A member of the Borage family, not valuable, except for a collection.

Whitlavia grandiflora.—A very pretty and free flowering member of the Borage family. The flowers are of an intense blue colour, and are produced for a long period, slightly difficult to transplant.

Schizanthus grandiflorus oculatus.—This was one of the most admired of all the annuals grown this season. It is remarkably floriferous, the plant attaining a large size, and being literally covered with its small orchid-like flowers of every shade. Hardy and easy of cultivation.

Sanvitallia procumbens.—A trailing annual producing numerous small (sunflower-like) flowers of no special value.

ANNUALS SOWN OUTSIDE.

As many farmers have not the time to spare for a hot-bed, we have for several years experimented in the sowing of annuals outside, and have found that a very creditable flower garden may be had by this means.

The varieties sown this year were as follows, the seed being sown thinly in rows, from May 6-10, two feet apart:—

Nasturtium Lobbianum.
Sweet Alyssum.
Abronia umbellata.
Brachycome iberidifolia.
Candytuft.
Clarkia pulchella.
Clarkia pulcherrima.
Clarkia alba.
Coreopsis Drummondii.
Coreopsis tinctoria.
Coreopsis Hybrida.
Godetia rubicunda splendens.
Godetia Whitneyi.
Godetia Lady Albemarle.
Linum grandiflorum roseum.
Poppies mixed.
Portulaca double.

All these flowered abundantly, the Godetia and Clarkia were especially showy and were much admired by visitors. By adopting this plan a very fine flower garden may be had with very little labour and expense.

PERENNIAL FLOWERS.

All the herbaceous perennials growing on the farm made a fine showing during the past season. A number of the clumps were divided this fall, and a new border commenced on the hillside along the main road, which will allow of easy access to visitors.

IRIS KOEMPFERI (JAPAN IRIS).

A very welcome addition was made to our collection of perennials by the receipt of a number of plants of this beautiful iris from the Central Experimental Farm, Ottawa. Nearly all became well established before winter, and a light covering of strawy manure was given them on the approach of severe weather. This is the most beautiful type of iris known, and we are looking forward with pleasure to their flowering next season.

COLCHICUM AUTUMNALE.

Mention of this bulb was made on page 351 of last year's report, and we have deemed it advisable to again call attention to its unique merits. After severe weather has set in, and often when the ground is covered with snow, this pretty little flower pushes through and makes a really beautiful sight, contrasting strongly with its dull surroundings. A bed of this would be a valuable acquisition to any Manitoba garden.

TENDER PERENNIAL BULBS.

A test was made some years ago to ascertain the possibility of flowering some of the tender bulbs, such as Hyacinths, Narcissi, &c., by means of specially heavy covering. The results were entirely satisfactory, the bulbs coming through the winter in good condition and flowering well. A similar experiment is being tried the present autumn. After planting, the bed was covered with two thicknesses of building tar paper, extending about four feet outside the bed, and on top of this, three feet of green manure was placed.

PROPAGATION OF TREES FOR THE FORESTRY BRANCH OF THE DEPARTMENT OF THE INTERIOR.

All the one million and a half of trees grown here in 1903 for the above department were distributed this spring to farmers in different parts of the province. They were unusually large and vigorous for seedlings and proved highly satisfactory to the farmers receiving them.

About one million trees were grown here this year for future distribution by the Forestry Branch, these were all taken up quickly and with very little expense, by means of a tree-digging plough, and all were healed in in good season ready for spring shipping.

DISTRIBUTION OF GRAIN, POTATOES, &c.

The usual distribution was mode of grain, potatoes, maple seed and rhubarb seed. The following quantities were sent out to applicants:—

Seedling trees and shrubs, packages	643
Potatoes in 3-pound bags	128
Wheat in 3-pound bags	134
Oats in 3-pound bags	166
Barley in 3-pound bags	60
Pease in 3-pound bags	49
Maple seed in 1-pound bags	77
Grass seed, one pound bags	22
Rhubarb seed, packages	33

SUMMARY OF REPORTS RECEIVED FROM FARMERS SUPPLIED WITH GRAIN, &C.

Number reporting on their experience with oats	40
" " " " potatoes	30
" " " " barley	17
" " " " wheat	10
" " " " pease	13

	Variety.	
Largest yield obtained from 3 lbs.	wheat (Red Fife)	130
" " " 3 "	oats (Banner)	181
" " " 3 "	barley (Odessa)	120
" " " 3 "	pease (Paragon)	120
" " " 3 "	potatoes (Lizzie's Pride)	290

SAMPLES FOR EXHIBITION PURPOSES.

A number of exhibits have been prepared and forwarded to England for two exhibitions held there during the past summer, an exhibit has also been prepared for the Universal Exposition to be held in Liege, Belgium, next year.

As usual exhibits were made at the Brandon Agricultural and Horticultural shows.

The Department of the Interior was also supplied with a large quantity of grain and grasses for the use of their immigration offices.

FARMERS' MEETINGS.

The farmers' meetings attended by me during the year had much larger audiences than usual, and the interest in the work of the experimental farms has in no wise abated.

During the year meetings were attended and addresses given at the following places:—

Blythe, December 14, 1903.
Brandon. January 16, 1904.
Morris, January 29, 1904.
Bradwardine, February 5, 1904.
Minnedosa, February 11, 1904.
Brandon, February 18, 1904.
Winnipeg, February 24 to 26, 1904.
Oak Lake, March 3, 1904.

VISITORS.

Owing to the Assiniboine river overflowing its banks, the road to the farm was impassable for some weeks in the spring, and as a consequence the number of visitors this year was not as large as usual, about 7,350 persons visited the farm during the year, as compared with 12,000 during 1902-3.

METEOROLOGICAL TABLES.

Months.	Highest temperature.		Lowest temperature.		Total rainfall.	Total snowfall.	Total amount of sunshine.
1903.	Day.	Deg.	Day.	Deg.	Inches.	Inches.	Hours.
December	2	38	13	−32	....	11	76·9
1904.							
January	7	34	24	−43	....	8	103·1
February	27	35	8	−39	....	27	130·2
March	6	33	2	−9	....	43	136·0
April	30	77	15	9	1·72	6	186·4
May	28	78	14	24	1·02	....	261·7
June	16	83	6	36	3·24	....	235·8
July	23	84	6	36	1·76	....	299·1
August	11	88	7	36	2·21	....	228·0
September	7	77	26	26	·82	....	151·2
October	11	69	5	15	·42	....	133·6
November	2	67	30	11	....	3	140·8
					11·19	98	2,081·8

CORRESPONDENCE.

The amount of correspondence shows a rapid increase this year, as 5,300 letters were received and 3,528 despatched, irrespective of circulars sent out.

I have the honour to be, sir,
Your obedient servant,

S. A. BEDFORD,
Superintendent.

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF ANGUS MACKAY, SUPERINTENDENT.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.,
November 30, 1904.

DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit to you the seventeenth annual report of the operations of the Experimental Farm for the North-west Territories at Indian Head, Assiniboia, during the year 1904.

The past season, for grain growers throughout the Territories, has been a success in many districts, while in others it has been very disappointing.

The winter was exceptionally fine up to the middle of January, when cold weather set in and continued up to April, with heavy falls of snow.

Seeding started late in April, and the soil being wet, very little was sown before the first week in May. Fine weather continued throughout May, and grain all came up evenly, and never made a more promising start; in fact, on well cultivated farms the growth early in June was too rank, and required a set-back for profitable returns. This set-back came in the form of dry, hot weather from June 10 to July 13, when a general rain set in and relieved all fears for the crop so far as moisture was concerned.

Wheat harvest commenced the last week in August, but was not general till September 1, and in many districts frost came on the night of September 10 while considerable grain was still standing, although in all districts the large bulk was in stook.

Drizzling rain retarded harvest work considerably, and continued up to the second week in October, when fine threshing weather set in, and from then to November 23 nothing could excel the wonderfully fine weather experienced throughout the whole of the Territories.

CROPS ON THE EXPERIMENTAL FARM.

The crops on the experimental farm have seldom been better, more uniform, of better quality, or more easily secured than during the past season.

Leaving out a few of the varieties tested, which will be referred to when reached, the returns have been very satisfactory, and the quality above the average.

In no case was the straw as heavy or long as in many previous years, and in only a few places was the grain lodged, or down in the least. The heads, however, were both large and well filled.

Rust, which did injury in parts of Manitoba, did not reach the dangerous stage in the Territories before the grain was ready to cut. On the experimental farm practically no harm was done. While rust appeared on the leaves of the wheat, the grain was too far advanced for the crop to be injured.

Wheat, oats and barley were all in stook when frost visited the country on the night of September 10. Pease were in a good many cases not ripe, and were more or less injured. The yields of all varieties were good, however.

EXPERIMENTS WITH WHEAT.

Thirty-six varieties were tested on 1-20 acre plots. In no case was the straw heavy, while in many sorts it was light. All were sown by hoe drill on April 29 on fallowed land; 1½ bushels seed was sown per acre, the soil being clay loam.

Preston was the first plot sown and among the first cut, and in this, as well as in the field tests, it was in stook before Red Fife was ripe, though the varieties were sown within a few hours of each other.

In this test Preston was cut on August 24 and Red Fife on September 6, a difference of thirteen days in favour of the former.

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Monarch	Aug. 31	124	40	Strong	3½	Bald	3,540	50	20	63½
2	Advance	" 31	124	36	"	3¼	"	3,480	49	45	59
3	White Russian	Sept. 3	127	37	"	3½	"	2,590	48	50	60½
4	Power's Fife (Minn. 149)	" 5	129	41	"	3½	"	2,320	48	40	63½
4	McKendry's Fife (Minn. 181)	" 8	132	36	"	4	"	3,300	45	30	62¾
6	Minnesota, No. 163	" 6	130	36	"	3½	"	4,120	45	20	62½
7	Australian, No. 19	" 7	131	37	"	3¼	"	4,640	44	20	62
8	Red Fife	" 6	130	36	"	3½	"	3,900	43	5	62½
9	Laurel	" 5	129	42	"	3½	"	3,780	42	50	62
10	Wellman's Fife	" 6	130	37	"	3¼	"	4,900	42	50	62½
11	Stanley	Aug. 25	118	36	"	3½	"	2,515	42	25	64
12	Benton	" 25	118	34	"	3	"	3,445	42	15	63
13	Clyde	Sept. 1	125	40	"	3¼	"	3,210	41	50	62
14	Australian, No. 9	Aug. 31	124	38	"	3	"	3,600	41	40	63½
15	Chester	" 27	120	33	"	3¼	"	2,620	41	10	65½
16	Percy	" 27	120	39	"	3½	"	3,295	41	5	63
17	Weldon	Sept. 5	129	38	"	3¾	"	2,860	40	20	63¾
18	Countess	Aug. 25	118	35	"	2½	"	3,095	40	5	63
19	Hayne's Blue Stem (Minn. 169)	Sept. 8	132	41	"	3½	"	3,600	40	—	60½
20	Preston	Aug. 24	117	36	"	3½	Bearded	3,600	39	40	65
21	Red Fern	" 31	124	37	"	4	"	2,955	38	45	64½
22	White Fife	Sept. 6	130	37	"	3¼	Bald	4,020	38	40	63½
23	Admiral	Aug. 25	118	35	"	3	Bearded	2,330	38	10	64½
24	Huron	" 25	118	35	"	3¼	"	2,455	36	5	64
25	Early Riga	" 20	113	28	"	2½	Bald	2,515	35	45	62
26	Dawn	" 24	117	28	"	3	"	2,335	34	25	65
27	Byron	" 22	115	32	"	3	Bearded	2,175	33	5	65¼
28	Rio Grande	Sept. 3	127	37	"	3½	"	3,400	32	45	64¼
29	Hastings	Aug. 25	118	33	"	2¾	Bald	2,050	32	20	64
30	Pringle's Champlain	Sept. 3	127	36	"	3¼	Bearded	2,460	31	25	64¾
31	Colorado	Aug. 28	121	33	"	2¾	"	3,160	31	5	65
32	Crawford	" 25	118	31	"	2½	Bald	2,400	30	—	64
33	Hungarian	" 31	124	33	"	2¾	Bearded	2,860	29	50	64
34	Herisson Bearded	Sept. 3	127	34	"	1¾	"	2,960	28	55	66
35	Plumper	Aug. 31	124	31	"	3	"	2,530	27	50	63½
36	Fraser	" 25	118	30	"	2½	"	1,885	27	35	65

TEST OF VARIETIES IN FIELD LOTS.

In this test eight sorts were used. Red Fife, Preston, Stanley and Percy were sown on new land which had been fallowed; Red Fife, Laurel, Wellman's Fife, White Fife and Huron were on old land fallowed previous year. All were sown by hoe drill at the rate of 1½ bushels per acre.

In this test Huron heads the list in yield, as it has done in the past three years under the same conditions, and as Huron is equal to Red Fife or Preston in milling

qualities, and, like Preston, is earlier than Red Fife, it is worthy of trial in many sections of country.

Like Preston, Huron is a cross-bred variety, White Fife and Ladoga being the parents. Preston's parents were Red Fife and Ladoga.

Number.	Name of Variety.	Character of Soil.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.
			Acres				Inches		Inches		Bush.	Lbs.	Lbs.
1	Huron, Old land...	Clay loam.	2	May 4	Aug. 30	118	38	Strong....	$3\frac{1}{4}$	Bearded	42	47	63
2	White Fife "	"	2	" 4	Sept. 9	128	43	"	$3\frac{3}{4}$	Bald ...	42	30	$61\frac{1}{2}$
3	Laurel "	"	6	April 30	" 7	130	44	Medium..	4	" ...	41	30	62
4	Well'an's Fife "	"	3	May 4	" 8	127	45	Strong.. .	4	" ...	41	4	63
5	Red Fife "	"	10	" 2	" 8	129	42	"	$3\frac{1}{2}$	" ...	40	57	$63\frac{1}{2}$
6	Red Fife, New land	"	5	April 29	" 5	129	37	"	$3\frac{1}{4}$	" ...	39	35	$62\frac{1}{2}$
7	Stanley "	"	5	" 30	Aug. 28	120	44	"	$3\frac{1}{2}$	" ...	38	20	60
8	Preston "	"	7	" 28	" 26	120	37	"	$3\frac{1}{2}$	Bearded	38	..	$63\frac{1}{2}$
9	Percy "	"	4	" 30	" 30	122	36	"	3	Bald ...	31	22	$63\frac{1}{2}$

WHEAT—FIELD LOTS.

Number.	Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
				Bush.	Lbs.	Bush.	Lbs.
1	Huron..................	Fallow.... .	2	42	47	85	34
2	White Fife..................	"	2	42	30	85	..
3	Laurel..................	"	6	41	30	249	..
4	Wellman's Fife..................	"	3	41	4	123	12
5	Red Fife..................	" . . .	10	40	57	409	30
6	Red Fife..................	"	5	39	35	197	55
7	Stanley..................	"	5	38	20	191	40
8	Preston..................	"	7	38	..	266	..
9	Percy..................	"	4	31	22	125	28
			44			1,733	19

Or an average of 39 bushels, 23 lbs. per acre.

COMPARISON OF FIELD LOTS OF WHEAT FOR THE LAST FOUR YEARS.

In view of the large demand for an early maturing variety of wheat, I give the date of seeding and ripening, time to mature and yield of four early and two late varieties. The six sorts have been grown in field lots each year under the same conditions with exception of seeding, which on account of weather could not all be done on the same date. Preston, Stanley and Huron mature in practically the same number of days.

Variety.	—	1901. —	1901. Yield.		1902. —	1902. Yield.		1903. —	1903. Yield.		1904. —	1904. Yield.		Average No. of days to mature.	Days less than Red Fife.	Average Yield.	
			Bush.	Lbs.		Bush.	Lbs.		Bush.	Lbs.		Bush.	Lbs.			Bush.	Lbs.
Red Fife	Sown	May 2	48	..	April 14	38	30	April 9	35	49	April 29	39	35	131¾	......	40	28
	Ripe	Aug. 27	..	..	Aug. 25	..	..	Sept. 4	..	..	Sept. 5	..	..	......	......	..	..
	Days	117	..	..	133	..	..	148	..	..	129	..	..	......	......	..	..
Preston (Red Fife and Ladoga)	Sown	May 4	45	45	April 17	29	..	April 14	38	..	April 28	38	..	122	9¾	37	41
	Ripe	Aug. 16	..	..	Aug. 22	..	..	Aug. 29	..	..	Aug. 26	..	..	......	......	..	..
	Days	104	..	..	127	..	..	137	..	..	129	..	..	......	......	..	..
Stanley (Red Fife and Ladoga)	Sown	May 6	40	45	April 17	34	..	April 14	37	18	April 30	38	20	121	10¾	37	35
	Ripe	Aug. 16	..	..	Aug. 20	..	..	Aug. 29	..	..	Aug. 28	..	..	......	......	..	..
	Days	102	..	..	125	..	..	137	..	..	120	..	..	......	......	..	..
Percy (White Fife and Ladoga)	Sown	May 3	36	18	April 16	32	30	April 14	30	18	April 30	31	22	124½	7¼	32	37
	Ripe	Aug. 20	..	..	Aug. 22	..	..	Aug. 31	..	..	Aug. 30	..	..	......	......	..	..
	Days	109	..	..	128	..	..	139	..	..	122	..	..	......	..	..	..
Huron (White Fife and Ladoga)	Sown	May 4	45	..	May 6	39	20	April 16	40	24	May 4	42	47	119¼	12½	41	52
	Ripe	Aug. 22	..	..	Aug. 26	..	..	Aug. 31	..	..	Aug. 30	..	..	......	......	..	..
	Days	110	..	..	112	..	..	137	..	..	118	..	..	......	......	..	..
Wellman's Fife	Sown	May 2	39	20	April 30	36	..	April 9	35	10	May 4	41	4	128¼	3½	37	53
	Ripe	Aug. 23	..	..	Aug. 30	..	..	Sept. 7	..	..	Sept. 8	..	..	......	......	..	..
	Days	113	..	..	122	..	..	151	..	..	127	..	..	......	......	..	..

FOUR YEARS TEST OF FALLOW AGAINST STUBBLE FOR GROWING WHEAT

In this test Red Fife wheat was used.

Cultivation.	1901.		1902.		1903.		1904.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Fallow	49	.	32	40	35	49	40	57
Stubble	38	32	25	..	16	..	31	28
Difference	10	8	7	40	19	49	9	29

Difference in four years in favour of fallow, 47 bushels 6 lbs.
Or an average of 11 bushels 46 lbs. per year.

SPRING WHEAT.

TEST OF FERTILIZERS.

Six plots of 1-40 acre each were sown on May 16 with Red Fife wheat, with hoe drill, at the rate of 1½ bushels per acre.

Although very little difference could be seen in the growth of straw, there was considerable variation in both straw and grain when threshed. The land was fallowed the previous year, the soil being clay loam.

SPRING WHEAT—TEST OF FERTILIZERS.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.	
			In.		In.	Lbs.	Bush.	Lbs.
Plot No. 1—Nitrate of soda, 100 lbs. per acre (half sown when grain was 2 in. high, balance when 6 in. high)	Sept. 9.	116	46	Strong ...	3¼	3,040	28	40
Plot No. 2—Nitrate of soda, 200 lbs. per acre (half sown when grain was 2 in. high, balance when 6 in. high)	" 9.	116	46	" ..	3¼	2,640	23	..
Plot No. 3—Superphosphate No. 1, 400 lbs. per acre (sown before grain and harrowed	" 9.	116	44	" ..	3¼	3,100	29	20
Plot No. 4—Check plot, unfertilized	" 9.	116	45	" ..	3¼	2,860	26	20
Plot No. 5—Muriate of potash, 200 lbs. per acre (sown before grain and harrowed)	" 9.	116	44	" ..	3¼	3,160	29	..
Plot No. 6—Superphosphate No. 1, 200 lbs. per acre; muriate of potash, 100 lbs. per acre; nitrate of soda, 100 lbs. per acre (half sown before grain and harrowed, balance when the grain was 2 in. high)	" 9.	116	45	" ..	3¼	3,280	31	40

COMPARISON OF RESULTS FOR THREE YEARS OF FERTILIZER TEST.

No. of Plot.	1901.		1902.		1903.	1904.		Average for 3 years.	
	Bush.	Lbs.	Bush.	Lbs.		Bush.	Lbs.	Bush.	Lbs.
Plot No. 1	61	20	28	..	Rusted	28	40	39	20
Plot No. 2	58	40	30	40	"	23	..	37	27
Plot No. 3	52	..	26	40	"	29	20	36	..
Plot No. 4 (untreated)	62	40	29	20	"	26	20	39	27
Plot No. 5	65	20	30	40	"	29	..	41	40
Plot No. 6	65	20	32	..	"	31	40	43	..

On account of all the plots being destroyed by rust in 1903, comparison can only be made for the three years. From these it will be seen that plot No. 6 (treated with superphosphate No. 1, muriate of potash and nitrate of soda) gave the best results.

SMUT TEST.

Three plots of Red Fife wheat were sown in this test—one untreated, one treated with bluestone at the rate of 1 lb. to 10 bushels of seed, and one treated with formalin, 6 oz. formalin to 10 bushels of seed, 10 gallons of water being used in each case. The seed treated with bluestone was dipped one minute; that with formaline 5 minutes.

Not a single head of smut was found in either of the three plots, showing that the season was not favourable to smut.

TEST OF EMMER AND SPELT.

Two varieties of Emmer and two of Spelt were sown on one-fortieth acre plots, by hoe drill, on fallowed land, clay loam, and Common Emmer was also sown on one acre lot. It will be noticed that in yield of both straw and grain, the Common Emmer gave much the best results.

EMMER AND SPELT—TEST OF VARIETIES.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.
				In.		In.		Lbs.	Lbs.
Common Emmer	May 14.	Sept. 9.	118	42	Medium	2	Bearded	5,580	3,100
White Spelt	" 14.	" 14.	123	46	Strong	4½	Bald	2,660	1,720
Red Emmer	" 14.	" 12.	121	51	"	3	Bearded	1,540	1,520
Red Spelt	" 14.	" 14.	123	55	"	4½	Bald	1,200	1,120
Common Emmer (field lot)	" 17.	" 13.	119	36	Medium	2¼	Bearded	......	2,744

MACARONI WHEAT—TEST OF VARIETIES.

Four varieties were sown on plots of 1-20 acre each, fallowed land, clay loam. All gave good yields. The straw of the Goose wheat was weak and lodged considerably.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs
1 Roumanian	April 29	Sept. 5.	129	44	Strong	3	Bearded	3,850	47	50	65
2 Mahmoudi	" 29	" 3.	127	39	"	2½	"	2,910	43	20	62½
3 Goose	" 29	Aug. 31.	124	38	"	2¼	"	3,655	43	5	64
4 Yellow Gharnovka	" 29	Sept. 5.	129	39	"	2¾	"	4,655	41	45	64

SUMMER FALLOWS.

In view of the great importance of properly preparing land for crops, and of the large number of new settlers coming into the country, I make no excuse for repeating

Cutting Western Rye Grass. Cocking Brome Hay.
Experimental Farm, Indian Head, N.W.T.

what was said in my last two reports respecting summer-fallows, and breaking up and cultivating new prairie land.

It is very gratifying to know that throughout the Territories, summer-fallowing is rapidly becoming general. No matter where farming is carried on, the farmers realize that to be sure of a crop they must prepare a portion of their land the year before the crop is grown, and apart from the value of the stored moisture, there is the inestimable advantage of keeping weeds from overrunning the farm.

The true worth of properly prepared fallows has been clearly demonstrated in past years in every grain-growing district of Assiniboia.

The work of preparing land for crop by fallowing is carried on in so many ways in different parts of the Territories, that perhaps a few words on some of the methods employed may be of help to at least some of the new settlers.

It has been observed in Alberta and Saskatchewan that the land to be fallowed is not, as a rule, touched until the weeds are full grown and in many cases, bearing fully matured seed. It is then ploughed.

By this method, which, no doubt, saves work at the time, the very object of a summer-fallow is defeated. In the first place, moisture is not conserved because the land has been pumped dry by the heavy growth of weeds; and, secondly, instead of using the summer-fallow as a means of eradicating weeds, a foundation is laid for years of labour and expense by the myriads of foul seeds turned under.

The endless fields of yellow-flowered weeds, generally Ball Mustard (*Neslia paniculata*), testify to the indifferent work done in many districts, and while no weed is more easily eradicated by a good system of fallows, there is no weed that is more easily propagated or takes greater advantage of poor work on fallows or of fall or spring cultivation.

As has been pointed out in my previous reports, early and thorough work on fallows is absolutely necessary to success, and I here repeat the methods and results of tests carried on for some years past.

First Method.—Ploughed deep (6 to 8 inches) before last of June; surface cultivated during the growing season, and just before or immediately after harvest ploughed 5 or 6 inches deep.

Result.—Too much late growth if season was at all wet ; grain late in ripening, and a large crop of weeds if the grain was in any way injured by winds.

Second Method.—Ploughed shallow (3 inches deep) before the last of June ; surface cultivated during the growing season, and ploughed shallow (3 to 4 inches deep) in the autumn.

Result.—Poor crop in a dry year; medium crop in a wet year. Not sufficiently stirred to enable soil to retain the moisture.

Third Method.—Ploughed shallow (3 inches) before the last of June; surface cultivated during the growing season, and ploughed deep (7 to 8 inches) in the autumn.

Result.—Soil too loose and does not retain moisture. Crop light and weedy in a dry year.

Fourth Method.—Ploughed deep (7 to 8 inches) before the last of June ; surface cultivated during the growing season.

Result.—Sufficient moisture conserved for a dry year, and not too much for a wet one. Few or no weeds, as all the seeds near the surface have germinated and been killed. Surface soil apt to blow more readily than when either of the other methods is followed. For the past fourteen years, the best, safest and cleanest grain has been grown on fallow worked in this way, and the method is therefore recommended.

Fallows that have been ploughed for the first time after the first of July, and especially after July 15, have never given good results ; and the plan too frequently followed of waiting till weeds are full grown, and often ripe, and ploughing under with the idea of enriching the soil, is a method that cannot be too earnestly advised against.

In the first place, after the rains are over in June or early in July, as they usually are, no amount of work, whether deep or shallow ploughing, or surface cultivation, can put moisture in the soil. The rain must fall on the first ploughing and be conserved by surface cultivation.

Weeds, when allowed to attain their full growth, take from the soil all the moisture put there by the June rains, and ploughing under weeds with their seeds ripe or nearly so, is adding a thousand-fold to the myriads already in the soil, and does not materially enrich the land.

BREAKING AND BACK-SETTING.

In view of the fact that every year brings to the Territories many new settlers, who are unacquainted with the methods of breaking up and preparing new land for crop, a few suggestions with regard to this very important work may not be amiss.

In all sections where the sod is thick and tough, breaking and back-setting should be done ; while in districts where scrub abounds and the sod is thin, deep breaking is all that is necessary.

The former is generally applicable to Assiniboia, and the latter to Alberta and Saskatchewan, especially to the northern parts of these Territories where the land is more or less scrubby.

SHALLOW-BREAKING.

(To be back-set.)

The sod should be turned over as thin as possible, and for this purpose a walking plough with a 12 or 14-inch share, is the best. When the breaking is completed (which should not be later than the second week in July), rolling will hasten the rotting process and permit back-setting to commence early in August.

BACK-SETTING.

Back-setting is merely turning the sod back to its original place, and at the same time bringing up two or three inches of fresh soil to cover it. The ploughing should be done in the same direction as the breaking and the same width of furrow turned. Two inches below the breaking is considered deep enough, but three to four inches will give better results.

After back-setting, the soil cannot be made too fine, and the use of disc or Randall harrow to cut up every piece of unrotted sod, will complete the work.

DEEP BREAKING.

Deep breaking, which in many sections of the country is the only practicable way of preparing new land, and which is, unfortunately, done in some instances where breaking and back-setting would give more satisfactory results, consists in the turning over of the sod as deeply as possible; usually from four to five inches.

When the sod has rotted, the top soil should be worked and made as fine as possible. The use of harrow and disc will fill up all irregularities on the surface, and make a fine, even seed-bed.

Whether the land is broken shallow or deep, it is necessary to have the work completed early, so as to take advantage of the rains which usually come during June or early in July. These rains cause the sod to rot, and without them, or if the ploughing is done after they are over, the sod remains in the same condition as when turned, and no amount of work will make up for the loss.

To some districts near the foot-hills of the mountains and in districts where scrub abounds and the sod is thin, these remarks may not apply; but as a rule, throughout the Territories, early breaking, whether deep or shallow, is advisable.

WORKING LAND AFTER FIRST CROP.

Inquiries are often made as to what should be done after taking off the first crop on new land, the question being as to whether the land should be ploughed, or cultivated, or sown without any cultivation whatever.

This, however, can only be determined by circumstances. In districts with heavy clay soil, a satisfactory crop may be expected from burning the stubble of the former crop and sowing with or without cultivation; although a shallow cultivation after the stubble is burnt usually gives the best results.

In districts with light soils and especially with gravelly subsoil, cultivation before seeding is necessary.

After taking the second crop from breaking or back-setting, there can be no doubt that the land should be well fallowed to put it in proper condition for succeeding crops. If the fallow is well made and the process repeated every third year, the settler will have started on the right road to future success.

SMUT.

On account of many new settlers coming into the country each year that can have no idea of the prevalence of smut, especially in the wheat crop, and the serious loss caused by this fungous disease, I submit the results obtained during the past years on this farm for their guidance.

Bunt or stinking smut in wheat is a fungous disease that attacks the grain more or less each year, and where at all bad, the crop is rendered unsaleable, and with only a few heads affected, if threshed in damp weather, the grade and price are reduced. No district is proof against smut, and though more prevalent in some seasons than others, it is wise to guard against all danger from this source each year. Three remedies have been tried repeatedly; these are, treating the seed with Bluestone (Copper Sulphate), with Formalin and with Massel powder. Bluestone, from cheapness, ease in application and effectual cure, has proven the best for wheat, while formalin has given the best results with smut in oats and barley. While formalin is not more expensive than bluestone, the application is more difficult in the seed having to be soaked longer.

For wheat apparently free from smut, 1 pound of bluestone crushed and dissolved in warm water and mixed with 10 gallons water, and the seed sprinkled with, or dipped in the solution, is sufficient for 10 bushels. For wheat at all affected, 1 pound bluestone to 5 bushels seed is required. The seed can be sprinkled or dipped as is most convenient, but, in sprinkling, care must be taken that every grain is wet with the solution.

For smut in oats or barley, 1 pound of formalin (which is a liquid), is sufficient for 50 bushels seed. If the seed is smutty the solution should be 8 or 9 ounces formalin to 10 gallons of water; if not smutty, 4½ ounces to the same quantity of water.

The seed should be soaked from 5 minutes to 2 hours, according to condition of grain and strength of solution.

EXPERIMENTS WITH OATS.

The yield of all varieties in both uniform plots and field lots, while not as high as in former years, was quite satisfactory. As will be seen, Banner again heads the list in both tests. The dry spell in June and first week in July reduced the yield considerably.

OATS—TEST OF VARIETIES.

Forty-two varieties were sown on May 7, on 1-20 acre plots (excepting three, which were on 1-40 acre), by hoe drill at the rate of two bushels per acre. The soil was clay loam, fallowed during the preceding season. In all the early ripening varieties the yield was reduced by blackbirds, both before being cut and while in stook.

Number.	Name of Variety.	Size of Plot.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
		Ac.			In.		In.		Lbs.	Bush.	Lbs.	
1	Banner	1/20	Aug. 26.	111	42	Strong..	8	Branching..	2,820	123	28	41
2	Irish Victor	1/20	" 27.	112	44	" ..	8	" ..	4,400	102	17	41½
3	Golden Tartarian	1/20	Sept. 3.	119	42	" ..	9	Sided	4,740	101	26	38½
4	Waverley..	1/20	Aug. 27.	112	50	" .	8	Branching..	4,960	101	21	42¼
5	Milford Black	1/20	Sept. 2.	118	45	" ..	8	Sided	4,480	101	13	38½
6	Danish Island	1/20	Aug. 27.	112	45	" ..	8	Branching..	3,740	98	28	41½
7	Kendal White	1/20	" 27.	112	42	" ..	8	" ..	5,040	98	28	41
8	Golden Giant	1/20	Sept. 3.	119	47	" ..	9	Sided	4,820	98	28	36
9	Pioneer	1/40	Aug. 20.	105	42	" ..	8	Branching..	5,440	98	18	39½
10	Goldfinder	1/20	" 29.	114	41	" ..	8	" ..	3,440	97	22	38
11	White Giant	1/20	" 26.	111	42	" ..	7	" ..	4,280	97	2	41
12	American Triumph	1/20	" 28.	113	40	" ..	7	" ..	2,320	95	30	40½
13	Columbus	1/20	" 28.	113	40	" ..	8	" ..	2,000	94	19	37½
14	Abundance	1/20	" 27.	112	45	" ..	9	" ..	4,420	93	23	41
15	Storm King	1/20	" 28.	113	41	" ..	8	Sided	6,220	93	19	39
16	Golden Beauty...	1/20	" 27.	112	41	" ..	8	Branching..	4,040	93	3	41
17	Pense Black	1/20	Sept. 2.	118	46	" ..	8	Sided	5,800	92	21	38½
18	Milford White	1/20	Aug. 28.	113	44	" ..	10	"	4,320	90	20	42
19	Olive Black	1/20	Sept. 2.	118	47	" ..	8	"	5,320	89	32	40
20	Twentieth Century	1/20	Aug. 25.	110	45	" ..	7	Branching..	4,620	89	14	41½
21	Scotch Potato	1/20	" 28.	113	45	" ..	8	" ..	4,120	87	22	40
22	Pense White	1/20	" 29.	114	43	" ..	8	Sided	6,220	87	2	40
23	American Beauty	1/20	" 27.	112	42	" ..	7	Branching..	3,940	86	11	42
24	Kendal Black	1/20	Sept. 2.	118	44	" ..	8	Sided	4,020	84	4	40
25	Bavarian	1/20	Aug. 27.	112	40	" ..	7	Branching..	3,440	83	18	39½
26	Siberian	1/20	" 28.	113	50	" ..	10	Sided	5,320	82	12	38
27	Golden Fleece	1/20	Sept. 1.	117	45	" ..	8	Branching..	6,000	82	7	40
28	Swedish Select	1/20	Aug. 23.	108	41	" ..	7	" ..	5,580	80	30	42
29	Improved Ligowo	1/20	" 25.	110	42	" ..	7	" ..	4,100	80	15	43
30	Sensation	1/20	" 22.	107	41	" ..	8	Sided	2,720	80	5	44
31	Joanette	1/40	Sept. 3.	119	35	" ..	8	Branching..	4,380	79	14	35½
32	Early Golden Prolific..	1/20	Aug. 27.	112	44	" ..	8	" ..	3,240	78	28	40½
33	Holstein Prolific	1/20	" 27.	112	42	" ..	8	" ..	2,380	78	13	40
34	Improved American.	1/20	" 27.	112	43	" ..	9	" ..	4,520	76	1	40½
35	*Black Beauty	1/20	" 20.	105	43	" ..	7	" ..	4,500	75	30	36½
36	Lincoln	1/20	" 28.	113	41	" ..	7	" ..	4,680	75	25	42
37	*Wide Awake	1/20	" 27.	112	41	" ..	8	" ..	3,320	75	5	43
38	*Thousand Dollar	1/20	" 22.	107	43	" ..	7	" ..	4,600	73	3	41½
39	*Mennonite	1/20	" 22.	107	47	" ..	8	" ..	4,000	71	26	39
40	*Buckbee's Illinois	1/20	" 23.	108	46	" ..	8	" ..	4,400	71	6	40
41	*Olive White	1/20	" 22.	107	46	" ..	8	Sided	2,040	69	26	39¾
42	*Tartar King	1/40	" 24.	109	45	" ..	8	"	3,650	69	..	38½

* The plots of these varieties were badly eaten by blackbirds, both before and after being cut.

OATS—FIELD LOTS.

Nine varieties were sown from May 6 to 13, by hoe drill, at the rate of two bushels per acre. Soil, clay loam, fallowed. Banner oats were also sown on Brome sod, broken and back-set the previous year after a crop of hay had been taken off.

The effects of the dry, hot weather were realized when the binders started. The field of 50 acres, in which six of the nine sorts were sown, was surrounded by hedges, and for 100 feet inside these the straw was much heavier, caused by the large quantity of snow lodged there during the winter. Inside the wet belt the dry weather reduced the yield of straw, as well as of grain, very materially.

OATS.—FIELD LOTS.

	Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.
		Acres.				In.		In.		Bush.	Lbs.	Lbs.
1	Banner	10	May 9	Aug. 26	109	43	Strong	8	Branching	85	24	38
2	Wide Awake	4½	" 12	Sept. 1	112	39	"	7	"	85	21	42
3	Black Beauty	2½	" 13	" 3	113	35	"	7	"	85	3	37½
4	Abundance	10	" 9	Aug. 27	110	43	"	8	"	77	5	41½
5	Banner	4	" 6	" 24	110	34	"	8	"	73	14	
6	Goldfinder	5	" 10	" 30	112	44	"	9	"	72	27	38
7	Improved Ligowo	5	" 12	Sept. 1	112	40	"	7	"	72		41½
8	Thousand Dollar	5	" 10	Aug. 27	109	43	"	7	"	71	24	41
9	Tartar King	5	" 12	" 27	107	46	"	8½	Sided.	70	22	37½
10	Waverley	9	" 10	" 27	109	45	"	8	Branching	70	1	42½

OAT CROP AND AVERAGE YIELD.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Banner	Fallow	10	85	24	857	2
Wide Awake	"	4½	85	21	385	9
Black Beauty	"	2½	85	3	212	24
Abundance	"	10	77	5	775	
Banner	Backsetting, Brome-sod	4	73	14	293	22
Goldfinder	Fallow	5	72	27	363	33
Improved Ligowo	"	5	72		360	
Thousand Dollar	"	5	71	24	358	18
Tartar King	"	5	70	22	353	8
Waverley	"	9	70	1	630	9
		60			4,589	23

Or an average of 76 bushels, 16 lbs. per acre.

COMPARISON OF FIELD LOTS OF OATS FOR LAST FOUR YEARS.

Date of ripening and yield of nine varieties of oats grown in field lots under the same conditions.

Variety.	1901.			1902.			1903.			1904.			Average.	
	Date ripe.	Bush.	Lbs.	Date ripe.	Bush.	Lbs.	Date ripe.	Bush.	Lbs.	Date ripe.	Bush.	Lbs.	Bush.	Lbs.
Banner	Aug. 19	117	..	Aug. 21	87	..	Aug. 25	119	2	Aug. 26	85	24	102	6
Abundance	" 22	124	20	" 23	80	..	" 29	106	..	" 27	77	5	96	32
Wide Awake	" 15	96	..	" 23	87	..	" 25	98	14	Sept. 1	85	21	91	17
Improved Ligowo	" 17	83	..	" 25	77	20	" 25	87	..	" 1	72	..	79	30
Thousand Dollar	" 23	92	4	Sept. 2	64	8	" 31	93	8	Aug. 27	71	24	80	11
Goldfinder	" 28	104	..	" 2	89	17	" 31	91	21	" 30	72	27	89	16
Tartar King	" 18	104	10	Aug. 20	85	..	" 22	86	12	" 27	70	22	86	16
Waverley	" 19	94	..	" 25	82	..	" 27	82	3	" 27	70	1	82	1
Black Beauty	" 19	93	..	Sept. 5	81	12	" 31	97	13	Sept. 3	85	3	89	7

FOUR YEARS TEST OF FALLOW AGAINST STUBBLE FOR GROWING OATS.

In this test Banner oats were used.

Cultivation.	1901.		1902.		1903.		1904.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Fallow	117	..	87	..	119	2	85	24
Stubble	97	32	32	26	47	12	70	24
Difference	19	2	54	8	71	24	15	..

Difference in four years in favour of fallow, 160 bushels; or an average of 40 bushels per year.

OATS—SMUT TEST.

Three plots were sown in this test: (1) Treated with bluestone, 1 pound to 10 bushels of seed; (2) Formalin, 6 ounces to 10 bushels, and (3) untreated.

No smut could be found in either of the three plots.

EXPERIMENTS WITH BARLEY.

TEST OF VARIETIES.

This test consisted of 19 varieties of two-rowed and 20 varieties of six-rowed barley. All were sown on fallowed land. On May 14, by hoe drill, at the rate of two bushels of seed per acre. Soil, clay loam.

All varieties gave large yields, but were coloured by rains.

TWO ROWED BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Standwell	Sept. 3	112	33	Strong	2½	3,610	67	9	52½
2	Invincible	" 3	112	35	"	3	3,835	67	4	53¼
3	Swedish Chevalier	" 1	110	34	"	3¾	4,510	63	16	53½
4	Primus	Aug. 27	105	33	"	3	3,865	62	24	55
5	Princess	Sept. 6	115	34	"	3¼	3,020	60	20	54
6	Hauncher	Aug. 30	108	33	"	3	4,080	60	20	55
7	Danish Chevalier	Sept. 7	116	33	"	2¾	3,200	59	8	51½
8	French Chevalier	" 7	116	32	"	4	3,200	58	16	51
9	Canadian Thorpe	Aug. 31	109	37	"	3	3,460	55	40	52
10	Fulton	" 20	98	35	"	2½	3,855	50	45	50¾
11	Beaver	Sept. 7	116	34	"	4	4,940	50	45	51
12	Gordon	Aug. 22	100	40	"	2½	2,345	49	23	50
13	Harvey	" 22	100	37	"	3	3,705	49	23	51½
14	Sidney	" 20	98	36	"	3½	2,830	48	46	53
15	Clifford	" 21	99	34	"	3¼	3,890	48	46	51½
16	Logan	" 22	100	40	"	3	4,915	47	29	51½
17	Dunham	" 23	101	32	"	3½	2,325	46	27	53
18	Jarvis	" 22	100	38	"	3¾	3,685	46	27	51
19	Newton	Sept. 5	114	33	"	2½	4,420	40	..	51½

SIX-ROWED BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Nugent	Aug. 20.	93	29	Strong.	2½	3,180	67	24	52
2	Claude	" 19.	97	34	"	2½	3,390	66	32	51½
3	Stella	" 20.	98	34	"	2	3,160	65	20	53½
4	Argyle	" 17.	95	37	"	2¼	2,740	64	28	52¾
5	Common	" 13.	91	30	"	2½	3,000	64	28	53
6	Yale	" 21.	99	34	"	3	4,120	64	8	52½
7	Odessa	" 16.	94	34	"	2	3,660	62	24	51
8	Rennie's Improved	" 16.	94	35	"	2½	3,010	62	9	53½
9	Summit	" 19.	97	31	"	3½	3,830	61	42	53
10	Brome	" 19.	97	32	"	2¾	3,220	60	40	52
11	Baxter	" 16.	94	28	"	2	3,650	59	13	53
12	Royal	" 15.	93	32	"	2¾	2,760	58	36	51½
13	Oderbruch	" 14.	92	32	"	3	3,245	57	19	52½
14	Empire	" 19.	97	35	"	2½	3,800	57	4	53½
15	Mansfield	" 15.	93	33	"	2¼	2,915	57	..	50½
16	Trooper	" 15.	93	34	"	2¼	3,210	57	..	51½
17	Garfield	" 15.	93	35	"	2½	2,455	53	41	51½
18	Albert	" 15.	93	33	"	2¾	3,000	53	36	52½
19	Mensury	" 15.	93	37	"	2¼	2,710	53	26	49½
20	Champion	" 12.	90	33	"	2½	2,880	41	7	47½

BARLEY—FIELD LOTS.

In this test nine varieties were used, five of six-rowed and four of two-rowed sorts. Mensury, Odessa, Royal, Mansfield and Sidney were sown on fallow, by hoe drill, two bushels of seed per acre. Claude was sown on corn land, and Invincible, Standwell and Canadian Thorpe on Brome sod broken after a crop of hay was taken off, and back-set late in the fall. Soil, clay loam.

The dates of breaking and back-setting are given below, and show that to be successful early work is required.

Variety.	Broken.	Backset.
Invincible	4–8 July	17–20 August.
Canadian Thorpe	4–10 August	26–28 September.
Standwell	7–10 "	3–7 November.

Name of Variety.	Cultivation.	Size of Plot.	Date of Sowing.	Date of Ripen'g.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.
						In.		In.		Bush.	Lbs.	Lbs
1 Mansfield	Fallow	2¼	May 13.	Aug. 23.	102	28	Strong. .	2¼	Six-rowed . .	56	32	52½
2 Mensury	"	4	" 12.	" 22.	102	34	" . .	2¼	" . .	55	41	52
3 Royal	"	2	" 13.	" 20.	99	24	" . .	2½	" . .	55	25	52
4 Invincible	Backsetting, Brome-sod.	2¼	" 7.	" 25.	110	22	" . .	2½	Two-rowed .	55	10	53½
5 Claude	Corn land . .	2½	" 7.	" 20.	105	30	" . .	3	Six-rowed . .	53	22	50
6 Odessa	Fallow	5½	" 13.	" 24.	103	28	" . .	2½	" . .	53	18	52
7 Sidney	"	4½	" 16.	" 25.	101	33	" . .	3¼	Two-rowed .	43	42	52
8 Canadian Thorpe	Backsetting, Brome-sod.	5	" 14.	" 26.	101	26	" . .	3	" . .	29	.	53
9 Standwell	"	6	" 14.	" 26.	104	24	" . .	2½	" . .	26	4	52

BARLEY CROP AND AVERAGE YIELD.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Mansfield	Fallow	2¼	56	32	127	24
Mensury	"	4	55	41	223	20
Royal	"	2	55	25	111	2
Invincible	Backsetting, Brome-sod	2¼	55	10	124	10
Claude	Corn land	2½	53	22	133	31
Odessa	Fallow	5½	53	18	293	27
Sidney	"	4½	43	42	197	21
Canadian Thorpe	Backsetting, Brome-sod	5	29	..	145	..
Standwell	" "	6	26	4	156	24
		34			1,512	15

Or an average of 44 bushels and 23 lbs. per acre.

COMPARISON OF FIELD LOTS OF BARLEY FOR THE LAST FOUR YEARS.

Date of ripening and yield of nine varieties of barley grown in field lots under the same conditions.

Variety.	1901.			1902.			1903.			1904.			Average	
	Date ripe.	Bush.	Lbs.	Date ripe.	Bush.	Lbs.	Date ripe.	Bush.	Lbs.	Date ripe.	Bush.	Lbs.	Bush.	Lbs.
1. Mensury	Aug. 10	59	40	Aug. 24	*51	12	Aug. 12	56	12	Aug. 22	55	41	55	38
2. Odessa	" 11	58	40	" 24	*65	..	" 12	48	28	" 24	53	18	56	21
3. Mansfield	" 14	*57	4	" 24	*57	44	" 25	50	..	" 23	56	32	55	20
4. Royal	" 12	*63	16	Sept. 4	56	..	" 10	67	3	" 20	55	25	60	23
5. Claude	" 11	66	12	Aug. 26	*66	32	" 25	66	..	" 20	53	22	63	4
6. Invincible	" 22	49	32	Sept. 6	63	16	" 28	59	25	" 25	55	10	56	45
7. Standwell	" 22	48	16	" 6	49	24	" 25	63	20	" 26	26	4	46	40
8. Sidney	" 15	60	10	" 1	66	..	" 21	54	20	" 25	43	42	56	6
9. Canadian Thorpe	" 18	44	..	" 1	68	36	" 21	53	39	" 26	29	..	48	43

*These yields are from the uniform test plots, as there were no field lots of the varieties in the year in question.

FOUR YEARS TEST OF FALLOW AGAINST STUBBLE FOR GROWING BARLEY.

The same variety cannot be given for the four years, as different sorts of barley were sown on stubble each year:—

Variety Sown.	1901.		1902.		1903.		1904.	
	Sidney.		Rennie's Improved.		Canadian Thorpe.		Mensury.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Fallow	60	10	51	..	53	39	55	41
Stubble	50	36	26	12	20	40	37	24
Difference	9	22	24	36	32	47	18	76

Difference in favour of Fallow in 4 years, 85 bushels 26 lbs.
Or an average of 21 bushels, 6 lbs per year.

BARLEY—SMUT TEST.

Bluestoned, Formalined and untreated seed was sown of barley, the same as in wheat and oats. The result was, no smut whatever, in either treated or untreated plots.

ROTATION OF CROPS.

The rotation test commenced in 1899 was continued the past year. As soon as crops were taken off in fall of 1903, each half acre was ploughed and harrowed. Before seeding in the spring the land was cultivated by cultivator or gang plow. Soil, clay loam. Sown at the rate of 1½ bushels of wheat, and 2 bushels of barley and oats per acre by hoe drill.

The leguminous crops were ploughed under as they obtained their best growth.

ROTATION CROPS.

The following rotation has been carried out since 1899 on half-acre plots. Since 1899, two rotations have been completed, the order of the plots in 1902, 1903 and 1904 being the same as in 1899, 1900 and 1901 respectively :—

No.	1899 and 1902.	1900 and 1903.	1901 and 1904.
1	Wheat	Oats	Soja Beans.
2	"	Wheat	Pease.
3	"	Oats.	Tares.
4	"	Wheat	Red Clover.
5	"	Barley	Alsike and Lucern.
6	Pease	Wheat	Wheat.
7	Tares	"	Oats.
8	Soja Beans	"	"
9	Red Clover	"	Wheat.
10	Alsike and Lucern	"	Barley.
11	Rape	"	Summer-fallow.
12	Wheat	"	"
13	"	Oats	"
14	"	Barley	"
15	"	Wheat	Oats.
16	"	Barley	"
17	Oats	Soja Beans	Wheat.
18	Wheat	Pease	"
19	Oats	Tares	"
20	Wheat	Red Clover	"
21	Barley	Alsike and Lucern	"
22	Rye	Summer-fallow	"

ROTATION TEST.—Results obtained in 1904. Plots, ½ acre each. Soil, clay loam.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.	
					In.		In.		Bush.	Lbs.
1	Soja Beans.	May 18..	....	Ploughed under		Aug.	6.	....	.....	.....
2	Pease..........	" 18..	....		"	"	6.	....	.....	.....
3	Tares..........	" 18..	....		"	" Oct.	3.	....	.....	.....
4	Red Clover.	" 28..	....		"	"	3.	....	.....	.....
5	Alsike and Lucern	" 28..	....		"	"	3.	....	.....	.....
6	Wheat, Red Fife..	" 4..	Sept. 5..	124	35	Strong......	3	Bald.......	31	28
7	Oats, Banner............	" 13..	" 1..	111	39	"	7	Branching. .	70	24
8	"	" 13..	1..	111	38	"	7	" ..	47	28
9	Wheat, Red Fife...............	" 3..	" 5..	125	35	"	$2\frac{3}{4}$	Bald.......	29	2
10	Barley, Mensury......	" 13..	Aug. 20..	99	30	"	$2\frac{1}{2}$	6-rowed	37	24
11	Summer-fallow.............	....	....	....	....	....	...	....	.....	.....
12	"	....	....	....	....	....	....	....	.....	.....
13	"	....	....	....	...	....	....	....	.....	.....
14	"	....	....	...	....	....	....	....	.....	.....
15	Oats, Banner........	May 13..	Sept. 1..	111	44	Strong......	7	Branching. .	82	14
16	"	" 13..	" 1..	111	36	"	7	" ..	50	20
17	Wheat, Red Fife.......	" 3..	" 5..	125	36	"	$3\frac{1}{4}$	Bald.	39	12
18	" "	" 3..	" 5..	125	38	"	3	"	36	8
19	" "	" 3..	" 5..	125	38	"	3	"	35	..
20	" "	" 3..	" 5..	125	37	"	3	"	32	6
21	" "	" 3..	" 5..	125	38	"	3	"	28	54
22	" "	" 3..	" 5..	125	40	"	$3\frac{1}{4}$	"	36	..

EXPERIMENTS WITH PEASE.

Thirty-one varieties of pease were tested on one-twentieth acre plots, on fallowed land, sown by hoe drill, on May 16, at the rate of 2 bushels of small, 2½ bushels medium and 3 bushels of large pease per acre. Soil, clay loam.

While all varieties gave large yields, nearly all were late in maturing, caused by the moist weather in August. Nine varieties were badly injured by frost on the night of September 10, and eight others more or less injured, leaving 14 that matured properly.

In addition to the uniform plots, White Wonder and Arthur, two early, medium sized sorts were sown 1½ acres of the former and 2½ acres of the latter), on fallowed land by hoe drill on May 17. Both sorts were entirely ripe when frost came, and the yield and sample satisfactory.

TEST OF GARDEN PEASE IN FIELD PLOTS.

To ascertain the yield of garden pease sown by grain drill, 8 varieties were sown alongside the uniform test plots of field pease on May 16, on plots of one-twentieth acre. Champion of England being a very late variety, did not ripen before the frost came. All the others did so, giving good yields.

Following were the yields per acre :—

	Bush.	Lbs.
Laxton's Charmer	58	40
Horsford's Market Garden	52	40
American Wonder	50	
Stratagem	48	
Shropshire Hero	48	
Premium Gem	42	40
Champion of England	42	
Alaska	41	20

PEASE—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				In.	In.		Bush.	Lbs.	Lbs
1 Picton	Sept. 9	116	Strong	60	2¼	Medium	68	20	58½
2 Prussian Blue	" 9	116	"	70	2	"	67	..	62½
3 Daniel O'Rourke	" 5	112	"	60	2½	Small	67	..	62½
4 Prince	" 10	118	"	55	2½	"	66	..	60¼
5 Agnes	" 7	114	"	50	2¾	Large	65	20	61
6 Black Eyed Marrowfat	" 16	123	"	65	3	"	63	40	60½
7 Pride	" 10	117	"	55	2½	Small	63	20	59
8 Crown	" 4	111	"	55	2	"	62	40	61½
9 White Wonder	" 1	108	"	60	2½	Large	62	20	62
10 Archer	" 10	117	"	72	2½	Medium	61	40	52½
11 Arthur	" 8	115	"	55	2	Large	61	40	63
12 German White	" 10	117	"	55	2½	Medium	61	40	62½
13 Paragon	" 13	120	"	65	3	"	61	20	59
14 Chancellor	" 9	116	"	60	3	Small	59	20	63
15 Carleton	" 18	125	"	55	2	Medium	59		53½
16 English Grey	" 11	118	"	60	2¼	Large	58	20	53
17 Pearl	" 11	118	"	60	2½	Medium	58	20	57
18 Golden Vine	" 4	111	"	45	2	Small	58		62½
19 Early Britain	" 9	116	"	65	2	"	55	40	51½
20 Large White Marrowfat	" 12	119	"	70	2¾	Large	55		60½
21 Duke	" 14	121	"	75	2½	Medium	54		55
22 Wisconsin Blue	" 9	116	"	60	2¼	Small	54		58½
23 King	" 14	121	"	60	2½	"	51	20	60½
24 Mummy	" 9	116	"	50	2	"	50	40	61½
25 Nelson	" 9	116	"	55	3	Medium	48	40	61½
26 Kent	" 17	124	"	65	2	"	45	40	56
27 Mackay	" 17	124	"	65	2¼	Large	45	40	56
28 Gregory	" 11	118	"	60	2¼	Medium	40		57
29 Prince Albert	" 10	117	"	55	2	Small	37	40	53½
30 Victoria	" 14	121	"	65	2	Medium	35	20	55
31 Macoun	" 17	124	"	60	2½	"	31	40	60½

EXPERIMENTS WITH INDIAN CORN.

Twenty varieties of corn were tested in hills and in rows. Both hills and rows were 35 inches apart. The corn was sown on clay loam on May 21, but in nearly all varieties one-third to one-half of the seed did not germinate, causing re-seeding during the first week in June.

Three varieties were also sown in rows at different distances apart. The yield per acre of all the varieties was computed from the weight of two rows, each 66 feet long.

In addition, six acres were sown with corn for ensilage. On account of poor germination, although re-sown, the crop was poor and unsatisfactory.

The corn land had been fallowed the previous year, and was in good condition.

The corn was cut on September 13, cut up and put in the silo.

INDIAN CORN—TEST OF VARIETIES.

	Name of Variety.	Character of Growth.	Height.	Condition when Cut.	Weight per Acre Grown in rows		Weight per Acre Grown in hills.	
			Inches		Tons.	Lbs.	Tons.	Lbs.
1	Angel of Midnight	Strong	70	Tasselled	22	770	14	710
2	King Philip	"	93	"	19	500	20	1,800
3	Salzer's All Gold	"	85	"	18	1,400	23	1,630
4	North Dakota White	"	78	In silk	18	300	22	880
5	Compton's Early	"	85	Tasselled	18	300	22	220
6	Champion White Pearl	"	90	"	15	1,130	16	1,000
7	White Cap Yellow Dent	"	83	"	15	800	19	830
8	Pride of the North	"	88	Not tasselled	14	1,700	14	1,920
9	Eureka	"	100	Tasselled	13	1,500	22	
10	Red Cob Ensilage	"	90	Not tasselled	13	1,500	21	680
11	Giant Prolific Ensilage	"	80	Tasselled	13	1,280	24	180
12	Longfellow	"	80	In silk	12	1,410	18	1,400
13	Thoro'bred White Flint	"	90	Not tasselled	11	1,650	22	1,540
14	Superior Fodder	"	85	"	11	1,320	18	1,400
15	Early Butler	"	95	"	11	880	18	80
16	Evergreen Sugar	Medium	64	Tasselled	10	350	15	580
17	Mammoth Cuban	Strong	92	"	10	20	15	1,680
18	Cloud's Early Yellow	"	80	"	9	700	16	780
19	Early Mastodon	"	96	"	9	700	13	290
20	Selected Leaming	Medium	80	Not tasselled	3	600	7	630

INDIAN CORN—TEST OF SEEDING AT DIFFERENT DISTANCES.

Name of Variety.	Distance Between Rows	Character of Growth.	Height.	Weight per Acre grown in Rows	
	Inches.		Inches.	Tons.	Lbs.
Longfellow	21	Strong	80	16	1,948
"	28	"	75	10	1,255
"	35	"	82	13	1,168
"	42	"	78	9	1,803
Champion White Pearl	21	"	70	9	860
" "	28	"	75	9	704
" "	35	"	72	7	829
" "	42	"	70	6	259
Selected Leaming	21	Weak	72	5	1,882
" "	28	"	72	5	1,336
" "	35	"	65	4	1,848
" "	42	"	73	3	601

Sown in rows by grain drill, May 21; cut September 13. Land fallowed previous year. Soil, clay loam.

EXPERIMENTS WITH FLAX.

Five varieties were tested on 1-20 acre plots of fallowed land, sown May 23, by grain drill, at the rate of 40 lbs. seed per acre.

Common flax was sown on 1-20 acre plots, at the rate of 20, 30, 40 and 50 lbs. of seed per acre.

Common flax was sown on ¾ acre that had grown flax the previous year, the land being ploughed in the fall, and cultivated just before seeding.

In addition, one acre of flax was sown on fallowed land, and two plots of nearly an acre each on low spots of land that came in too late for a grain crop.

The results of all tests were as follows:—

FLAX—TEST OF VARIETIES

Name of Variety.	Character of Soil.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Weight of Straw.	Yield per Acre.	
		Ac.				In.		Lbs.	Bush.	Lbs.
White Flowering....	Clay loam ..	1/20	May 23..	Sept. 1..	101	22	Strong .	2,960	19	36
Yellow Seeded.... .	" ..	1/20	" 23..	" 1..	101	28	" ..	3,440	18	32
Improved Russian...	" ..	1/20	" 23..	Aug. 26..	95	32	" ..	3,180	18	12
Riga	" ..	1/20	" 23..	Sept. 1..	101	34	" ..	3,060	17	48
Common...........	" ..	1/20	" 23..	" 1..	101	33	" ..	3,200	12	28

FLAX—TEST OF SOWING DIFFERENT QUANTITIES OF SEED PER ACRE.

Seed per Acre.										
20 lbs	....	1/20	May 23..	Aug. 31..	100	25	Strong .	1,640	16	24
30 "	....	1/20	" 23..	" 31..	100	25	" ..	2,700	16	44
40 "	....	1/20	" 23..	" 31..	100	26	" ..	1,680	18	24
50 "	....	1/20	" 23..	" 31..	100	26	" ..	1,500	16	44

Name of Variety.	Cultivation.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Yield per Acre.	
		Ac.				In.		Bush.	Lbs.
Flax.............	Flax stubble, ploughed..	¾	May 23..	Aug. 22..	91	30	Strong .	9	33
"	Fallow.................	1	" 23..	" 30..	99	26	" ..	19	18
"	"	¾	" 27..	" 29..	94	24	" ..	13	..
"	"	¾	" 27..	" 29..	94	25	" ..	12	24

EXPERIMENT WITH SPRING RYE.

Sown May 16, on 1-20 acre plot of fallowed land. Ripe August 15; time to mature, 91 days. Straw strong; 42 inches long; weight of straw per acre, 1,880 lbs. Length of head, 3 inches. Yield per acre, 18 bushels.

EXPERIMENT WITH TARES.

Sown on 1-20 acre plot of fallowed land, May 18. Ripe September 9; time to mature, 114 days. Length of straw, 28 inches; pod, 2½ inches. Yield per acre, 26½ bushels, weighing 54 lbs. per bushel.

EXPERIMENT WITH CANARY GRASS.

(Phalaris canariensis.)

Sown May 16, on 1-20 acre plot of fallowed land. Ripe August 18; time to mature, 94 days. Straw strong, 32 inches long; weight of straw per acre, 2,200 lbs. Length of head, 1¼ inches. Yield per acre, 15 bushels 20 lbs., weighing 49 lbs. per bushel.

EXPERIMENT WITH SOJA BEANS.

Sown May 17, in rows 21, 28 and 35 inches apart. These were killed by frost, and did not mature or even form pods.

EXPERIMENT WITH HORSE BEANS.

Sown May 17, in rows 21, 28 and 35 inches apart. Cut Sept. 10.

Variety.	Rows, Distance Apart.	Height.	Yield per Acre. Dry Fodder.	
	Inches.	Inches.	Tons.	Lbs.
Horse beans	21	38	3	880
"	28	34	3	896
"	35	35	2	946

EXPERIMENTS WITH MILLETS.

Six varieties were sown May 23, on 1-40th acre plots of fallowed land. All were very poor and did not mature. Cut for feed September 10.

Variety.	Height.	Yield per acre; Dry fodder.	
	Ins.	Tons.	Pounds.
Moha Hungarian	37	3	..
White Round French	36	2	800
Italian	39	3	400
Cat Tail	31	Very little germinated.	
Early Pearl	35	"	"
Moha Green Californian	39	3	800

HAY CROP.

The hay crop the past season was light. Brome averaged about 1¼ tons per acre, and Western Rye Grass 1½ tons per acre.

One-half acre of Brome, ploughed 2 inches deep in May, 1903, disced and rolled flat, gave this year one ton of hay without re-seeding.

All the Brome and Rye Grass fields have been cut for hay from 3 to 6 years.

Timothy gave 850 lbs. on a ½ acre plot.

The ½ acre of Alfalfa sown in 1902 was almost entirely killed by the spring frosts.

TEST OF GRASSES.

In May the following clovers and grasses were sown in plots of ¼ to ½ acre each:—

Western Red Clover, Lucern, Alsike, Turkestan Alfalfa, Utah Alfalfa, Mixture of Red Clover, Alsike, Orchard and Blue Grass, Mixture of Orchard, Blue Grass and Common Alfalfa, Meadow Fescue, Red Top, Kentucky Blue Grass, English Blue Grass, Western Rye Grass.

Three varieties of Alfalfa, Common, Utah and Turkestan, were tested for the Department of Agriculture, Regina.

With the exception of Red Top, which failed to germinate, all the varieties did well. The three kinds of Alfalfa and the Red Clover did extra well.

Common Alfalfa attained a height of 20 inches, Turkestan 18 inches, and Utah Alfalfa 17 inches. All the clovers were quite well headed out before the growing season was over.

Cattle were pastured on the grasses to a small extent after the growing season, for fear of smothering out the plants from too rank a growth.

EXPERIMENTS WITH FIELD ROOTS.

With the exception of carrots, the root crop was very satisfactory. After the carrots were in full leaf, they were eaten close to the ground by the larvæ of a small moth or butterfly, and never recovered from the injury.

Turnips and mangels were good, with the second seeding rather the better.

The land for all the roots had been fallowed the previous year, with two deep ploughings and surface cultivation, and when frost came in the fall, 10 loads of manure per acre were spread on the surface, and cultivated in, shallow, just before sowing the seed in the spring.

The rows were made by grain drill, on the flat, and the seed sown by a Planet Junior turnip drill. All the rows were 28 inches apart.

Soil, clay loam. The yields per acre were obtained by weighing the roots from two rows, each 66 feet long.

TURNIPS—TEST OF VARIETIES.

Twenty varieties were sown on May 19, and again on May 27. The roots from both seedings were taken up on October 18.

Number.	Name of Variety.	Character of Soil.	Yield per Acre.							
			1st Plot.				2nd Plot.			
			Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Drummond Purple-top	Clay loam ..	29	268	971	8	29	1,541	992	21
2	Skirving's	" ..	28	854	947	34	30	814	1,013	34
3	New Century	" ..	26	1,318	888	38	30	248	1,004	8
4	Imperial Swede	" ..	26	1,036	883	56	29	834	980	34
5	Emperor	" ..	26	1,036	883	56	28	430	940	30
6	Jumbo	" ..	26	611	876	51	24	227	803	47
7	Magnum Bonum	" ..	26	187	869	47	30	1,946	1,032	26
8	Good Luck	" ..	26	46	867	26	30	1,521	1,025	21
9	Hall's Westbury	" ..	25	1,904	865	4	25	1,621	860	21
10	Halewood's Bronze-top	" ..	25	1,480	858	..	20	448	674	8
11	Perfection Swede	" ..	25	1,338	855	38	31	228	1,037	8
12	Elephants Master	" ..	24	1,641	827	21	23	247	770	47
13	Mammoth Clyde	" ..	23	1,944	799	4	25	1,763	862	43
14	Bangholm Selected	" ..	23	813	780	13	26	753	879	13
15	Kangaroo	" ..	22	1,964	766	4	26	1,177	919	37
16	Sutton's Champion	" ..	22	1,974	766	4	26	1,743	895	43
17	Hartley's Bronze	" ..	22	974	749	34	26	1,036	883	56
18	East Lothian	" ..	21	570	709	30	22	1,540	759	..
19	Selected Purple Top	" ..	21	287	704	47	28	6	933	26
20	Carter's Elephant	" ..	20	1,438	690	38	26	1,884	898	4

MANGELS—TEST OF VARIETIES.

Sixteen varieties were sown on May 19 and 27. All were taken up October 3.

Number.	Name of Variety.	Character of Soil.	Yield per Acre.							
			1st Plot.				2nd Plot.			
			Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Prizewinner Yellow Globe	Clay loam..	23	1,237	787	17	27	1,581	926	21
2	Triumph Yellow Globe	" ..	23	388	773	8	27	1,581	926	21
3	Half-long Sugar White	" ..	21	..	700	..	26	1,743	895	43
4	Giant Yellow Intermediate	" ..	19	1,176	652	56	18	347	605	47
5	Selected Mammoth Long Red	" ..	19	327	638	47	16	953	549	13
6	Yellow Intermediate	" ..	19	186	636	26	16	1,094	551	34
7	Giant Yellow Globe	" ..	18	1,903	631	43	26	1,743	895	43
8	Leviathan Long Red	" ..	18	1,478	624	38	23	1,944	799	4
9	Half-long Sugar Rosy	" ..	18	1,054	617	34	14	1,134	485	34
10	Prize Mammoth Long Red	" ..	18	206	603	26	17	1,498	591	38
11	Mammoth Yellow Intermediate	" ..	17	650	577	30	23	1,237	787	17
12	Mammoth Long Red	" ..	16	1,094	551	34	17	1,781	596	21
13	Gate Post	" ..	16	528	542	8	23	247	770	47
14	Lion Yellow Intermediate	" ..		*		*	25	914	848	34
15	Selected Yellow Globe	" ..		*		*	23	621	777	51
16	Giant Sugar	" ..		*		*	22	1,823	763	43

* These varieties were not sown at first seeding.

CARROTS—TEST OF VARIETIES.

Ten varieties were sown May 19 and were pulled October 20. The second plots were not sown.

Number.	Name of Variety.	Character of Soil.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs.
1	Improved Short White	Clay loam	7	284	238	4
2	White Belgian	"	6	1,294	221	34
3	Half-long Chantenay	"	5	1,314	188	34
4	Giant White Vosges	"	4	1,051	150	51
5	New White Intermediate	"	4	768	146	8
6	Long Yellow Stump-rooted	"	2	1,657	94	17
7	Carter's Orange Giant	"	2	1,091	84	51
8	Early Gem	"	2	1,091	84	51
9	Mammoth White Intermediate	"	1	1,536	58	56
10	Ontario Champion	"	1	1,536	58	56

SUGAR BEETS—TEST OF VARIETIES.

First plots sown May 19 and second plots May 27. Both were pulled October 6.

Number.	Name of Variety.	Character of Soil.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs.	2nd Plot. Tons.	Lbs.	Bush.	Lbs.
1	Royal Giant	Clay loam	17	367	572	47	23	388	773	8
2	Danish Red Top	"	14	1,134	485	34	18	1,054	617	34
3	Improved Imperial	"	14	286	471	26	16	1,094	551	34
4	Red Top Sugar	"	14	286	471	26	18	1,196	619	56
5	Danish Improved	"	12	1,598	426	38	18	1,478	624	38
6	French Very Rich	"	11	1,194	386	34	12	43	400	43
7	Vilmorin's Improved	"	10	1,921	365	21	9	1,800	330	..
8	Wanzleben	"	9	810	313	30	9	1,658	327	38

EXPERIMENTS WITH POTATOES.

Forty-one varieties of potatoes were planted on May 20. The land was fallowed the same as for roots, and ten loads of manure applied per acre.

While the potatoes were all of a fair size, sound, and of splendid quality, the yield in no case was equal to that of 1903.

The sets were dropped in drills 30 inches apart, and the potatoes were dug on September 29. The yield per acre was obtained by weighing the potatoes from one row 132 feet long. Soil, clay loam. There was no rot in any of the varieties.

POTATOES—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Soil.	Planted.	Dug.	Character of Growth.	Average Size.	Total Yield per Acre. Bush.	Lbs.	Form and Colour.
1	Penn Manor	Clay loam.	May 20	Sept. 29	Medium	Large	435	36	Long, red.
2	Uncle Sam	"	" 20	" 29	Strong	"	420	12	Oval, white.
3	Sabean's Elephant	"	" 20	" 29	"	"	409	12	Long "
4	Late Puritan	"	" 20	" 29	"	"	404	48	Oval "
5	General Gordon	"	" 20	" 29	"	"	393	48	" pink.
6	American Giant	"	" 20	" 29	"	"	391	36	Long, white.
7	Prolific Rose	"	" 20	" 29	"	Medium	374	..	" red.
8	Early Envoy	"	" 20	" 29	Medium	Large	374	..	Oval, pink.
9	Reeve's Rose	"	" 20	" 29	Strong	Medium	374	..	" red.
10	Country Gentleman	"	" 20	" 29	"	"	371	48	Long, pink.
11	Money Maker	"	" 20	" 29	"	Large	371	48	Oval, white.
12	State of Maine	"	" 20	" 29	"	"	369	36	"
13	Early St. George	"	" 20	" 29	"	Medium	365	12	Long, red.
14	Pingree	"	" 20	" 29	Medium	"	360	48	" white.
15	Dreer's Standard	"	" 20	" 29	"	"	352	..	Oval "
16	American Wonder	"	" 20	" 29	Strong	Large	345	24	Long "
17	Burnaby Mammoth	"	" 20	" 29	"	Medium	345	24	" pink.
18	Carman No. 3	"	" 20	" 29	"	Large	343	12	Oval, white.
19	Seedling No. 7	"	" 20	" 29	"	"	330	..	" red.
20	Holborn Abundance	"	" 20	" 29	"	"	327	48	" white.
21	Pearce	"	" 20	" 29	"	"	323	24	Long, pink.
22	Delaware	"	" 20	" 29	"	"	323	24	Oval, white.
23	Vick's Extra Early	"	" 20	" 29	"	"	321	12	" pink.
24	Carman No. 1	"	" 20	" 29	"	"	314	36	" white
25	Enormous	"	" 20	" 29	"	"	314	36	Long "
26	Rose No. 9	"	" 20	" 29	Medium	"	314	36	" red.
27	Everett	"	" 20	" 29	"	"	312	24	" pink.
28	Irish Cobbler	"	" 20	" 29	"	"	305	48	Oval, white.
29	Rochester Rose	"	" 20	" 29	Strong	"	305	48	Long, red.
30	Early Rose	"	" 20	" 29	Medium	"	288	12	Oval "
31	Maule's Thoroughbred	"	" 20	" 29	Strong	Medium	281	36	" pink.
32	Early White Prize	"	" 20	" 29	Medium	Small	279	24	" white.
33	Empire State	"	" 20	" 29	Strong	Large	275	..	" "
34	Swiss Snowflake	"	" 20	" 29	Medium	Medium	259	36	Long, red.
35	Canadian Beauty	"	" 20	" 29	Strong	Large	257	24	Oval, pink.
36	Bovee	"	" 20	" 29	Light	"	244	24	"
37	I. X. L	"	" 20	" 29	Strong	Medium	239	48	Long, pink.
38	Clay Rose	"	" 20	" 29	"	Large	237	36	Oval "
39	Early Andes	"	" 20	" 29	Medium	Medium	228	48	" "
40	Rawdon Rose	"	" 20	" 29	"	Large	226	36	" "
41	Cambridge Russet	"	" 20	" 29	Strong	Medium	226	36	Long, russet.

SUMMARY OF CROPS, 1904.

	Bushels.
Wheat :	
8 varieties, 44 acres	1,733
8 half acres, rotation test	135
36 uniform test plots	92
	1,960
Oats :	
9 varieties, 60 acres	4,589
4 half acres, rotation test	125
42 uniform test plots	157
	4,871

	Bushels.	
Barley :		
9 varieties, 34 acres	1,512	
1 half acre, rotation test	18	
39 uniform test plots	90	
	1,620	
Pease :		
2 varieties, 4 acres	170	
31 uniform test plots	85	
	255	
Flax	52	
Rye	1	
	Tons.	Lbs.
Emmer and Spelt	....	2,254
Corn, ensilage	45	
Hay:		
Brome grass	35	
Rye grass	25	
Timothy	....	850
	60	850
	Bushels.	
Roots	3,000	
Potatoes	100	
	3,100	

VEGETABLE GARDEN.

The experiments with vegetables were fairly successful this year. A few varieties of beans did not mature. Cucumbers, citrons and melons were poor. The balance of the vegetables were satisfactory.

ASPARAGUS.

Old beds of Barr's Mammoth, Barr's Elmira and Conover's Colossal were in use from May 21 to July 14, producing a good crop.

Asparagus seed was sown on May 18.

BEANS.—Sown May 21.

Imported Seed.	In Use, Green.	Ripe.	Remarks.
Dwarf Extra Early	July 26	Sept. 14	Green; very good crop.
" Emperor of Russia	Aug. 1	Did not mature	" good crop.
" Fame of Vitry	" 5	"	" "
" Black Speckled	" 3	"	" "
" Golden Skinless	" 2	"	Wax; "
" Matchless	" 1	"	Green; fair crop.
Experimental Farm Seed.			
Currie's Rust-proof	July 30	Sept. 14	Wax; very good crop.
Challenge Black Wax	" 28	" 14	" "
Early Six Weeks	" 30	" 14	Green; "
Dwarf Kidney	" 28	" 14	Wax; fair crop.
Detroit Wax	" 30	Did not mature	" "

BEETS.

Sown May 9, in use July 25; pulled October 5.
Nutting's Dwarf Improved, 847 bushels per acre; large, smooth.
Early Blood Red Turnip, 435 bushels per acre; medium size, good quality.
Flat Egyptian, 1,060 bushels per acre; large, good.
Long Smooth Blood, 411 bushels per acre; small, good.
Superb Northern Red, 686 bushels per acre; medium long.
Reselected Perfection, 686 bushels per acre; medium size.

BROCOLI.

Sown in hot-house April 1 and 20; set out May 30 and June 7; in use, August 6.
Extra Early White.

BRUSSELS SPROUTS.

Sown in hot-house April 1 and 20; set out May 30 and June 7.
Dwarf Improved, in use August 5; fair crop.
Northern Prize, in use August 5; fair crop.

CARROTS.

Sown May 9, in use July 26; pulled October 5.
Long Blood, 609 bushels per acre; large and smooth, good.
French Horn, 602 bushels per acre; medium size.
Half-long Chantenay, 484 bushels per acre; large and smooth, good.
Half-long Luc, 226 bushels per acre; medium size, good quality.

CELERY.

Large Red Ribbed, Paris Golden Yellow, Rose Ribbed Paris, Giant Pascal and White Plume were sown in hot-house, April 1; transplanted, May 2; set out, June 17; in use, September 1.

The crop was of fairly good quality.

CABBAGE.

Sown in hot-house, April 1; set out, May 30; second seeding, April 20; set out, June 7.

Name of Variety.	1st Seeding.		2nd Seeding.		Remarks.
	In Use.	Average Weight.	In Use.	Average Weight.	
		Lbs.		Lbs.	
Winningstadt Early	Sept. 10	9	Sept. 15	8	Good.
Early Jersey Wakefield	" 5	9	" 10	11	"
Extra Early Express	" 1	8	" 6	9	"
Paris Market	" 1	10	" 6	9	"
Midsummer Savoy	" 1	11	" 6	10	"
Green Globe Savoy	" 6	8	" 12	8	"
Fottler's Drumhead	" —	5	" —	5	Poor.
Large Red Drumhead	" 10	12	" —	11	Good.
Early Enfield Market	July 30	8	Aug. 4	7	"

KALE.

Drumhead Kale was sown in hot-house April 1; set out May 30, but was a failure.

CAULIFLOWER.

Sown in hot-house April 1; set out May 30. Second seeding April 20; set out June 7.

Name of Variety.	1st Seeding.		2nd Seeding.		Remarks.
	In Use.	Average Weight.	In Use.	Average Weight.	
		Lbs.		Lbs.	
Half Early Paris................	July 21....	6	July 30.. .	6	Good quality, except that a few heads grew too loosely.
Earliest Dwarf Erfurt...	" 21....	6	" 30....	6	
Early Snowball.......	" 21....	6	" 30....	6	

GARDEN CORN.

Name of Variety.	In Use, Green.	Ripe.	Remarks.
Red Squaw, sown May 20..............	Aug. 23....	Sept. 13 ..	Good crop.
White Squaw, "	" 23....	" 13....	"
Peep o' Day, "	" 13....	....	Did not mature.
New Premo, "	" 13....	....	"
Golden Bantum, "	....	....	"

CUCUMBERS.

Early White Spine and Cumberland were sown May 2 in hot-house; set out May 29; in flower July 10; ripe September 15. A fair crop.

CITRONS.

Preserving.—Sown in hot-house, May 2; set out, May 27 ; in flower, July 10; ripe, September 16. Medium size.

LETTUCE.

1st sowing, May 9; in use, June 16. 2nd sowing, June 4; in use, July 16. All varieties were of good quality.

The following sorts were sown:—Cabbage—Neapolitan, Tom Thumb, Blond Stonehead, All the Year Round, Red Edged Victoria and Trocadero Red Edged. Cos—Green Paris and Early Trianon.

MELONS.

The following varieties were sown in hot-house, May 2; set out, May 27. Did not mature.

Musk melon—Extra Early Green and Hamilton Market.

Water melon—Cole's Early and Phinney's Early.

The same varieties were sown in the open May 27, but did not come up.

ONIONS.

Sown in hot-house, April 1; set out, May 30; lifted, September 29.

Variety.	Yield per Acre.		Size and Quality.
	Bush.	Lbs.	
Large Red Wethersfield	217	48	Large, good.
Danver's Yellow Globe	205	42	"
Market Favorite	145	12	Medium, good.
Trebon's Large Yellow	108	54	Small, good.
Giant Prizetaker	72	36	Medium, good.
Spanish King	60	30	Small, good.

Sown in open, May 9; lifted, September 30.

Giant Prizetaker	181	30	Large, good.
Trebon's Large Yellow	145	12	Medium, fair.
Spanish King	133	6	Poor and thick-necked.
Danver's Yellow Globe	121	..	Medium, fair.
Market Favorite	121	..	Small, fair.
Paris Silverskin	121	..	"
Large Red Wethersfield	96	48	"

PUMPKINS.

Sown in hot-house, May 2; set out, May 27.
Large Yellow Field. Weight of pumpkin, 61 pounds.
New Japanese Pie. Did not fruit.

PEPPERS.

Ruby King, sown in hot-house, April 7; set out, June 10. Did not mature.

SQUASH.

Long White Bush Marrow, sown in hot-house May 2; set out, June 9; ripe, September 13. Average weight, 14 lbs. Fruit good quality, but a poor crop.

This was also sown in open, May 27, but did not come up.

KOHL RABI.

Early Purple Vienna, sown in hot-house, April 1; set out, May 30; in use, July 28; average weight, 9 pounds.

TURNIPS.

Sown, May 20; in use, August 1; pulled, October 7. Good quality.

	Yield per acre. Bushels.
Early White Strap-leaved	940
Extra Early White Milan	825
Early Stone	716
Robertson's Golden Ball	614

TOMATOES.

Sown in hot-house, April 1; set out, May 30; in flower, June 23.

In use, Green.

Earliana, September 16; some ripened; large and smooth.
Sparks' Earliana, September, 10; a little rough when ripe.
Up-to-date, September 10; some ripened; light crop.
Earliest of All, September 10; some ripened; good crop and quality.

PARSNIPS.

Sown, May 9; in use, September 13; lifted, October 6.
Hollow Crown, yield per acre, 355 bushels; fair quality.
The Student, yield per acre, 508 bushels; large and good quality.

GARDEN PEASE.

Variety.	Sown May 14 and 26.				
	1st Seeding.		2nd Seeding.		Remarks.
	In use, green.	Ripe.	In use, green.	Ripe.	
Admiral	July 28	Sept. 14	Aug. 1	Sept. 14	Fair crop.
American Wonder	Aug. 1	" 14	" 10	" 14	"
Anticipation	" 1	" 28	" 10	" 28	Good.
Alaska	" 1	" 28	....	" 28	"
Burpee's Profusion	July 28	" 17	....	" 25	"
Extra Early	" 16	" 6	July 23	" 23	"
Everbearing	Aug. 1	" 24	Aug. 12	" 24	"
First of All	July 14	" 30	July 23	" 14	Fair.
First and Best	" 14	" 6	" 23	" 16	"
Surprise	" 14	" 6	" 23	" 16	"
Stratagem	" 30	" 25	Aug. 12	" 25	Good.
Shropshire Hero	Aug. 6	" 24	" 6	" 24	"
Laxton's Charmer	July 28	" 24	" 10	" 24	"
Champion of England	Aug. 1	" 25	" 12	" 25	"
Horsford's Market Garden	July 28	" 25	" 10	" 25	"
Wm. Hurst	" 14	" 6	July 23	" 16	"
Rural New Yorker	" 14	" 6	" 23	" 14	Fair.
Premium Gem	" 14	" 6	" 24	" 10	"
Nott's Excelsior	" 15	Aug. 30	" 24	Aug. 30	"
Harrison's Glory	....	....	....	....	No crop.
Yorkshire Hero	Aug. 1	Sept. 24	Aug. 10	Sept. 24	Fair.

RADISH.

Sown May 9 and June 4.	1st Seeding. — In use.	2nd Seeding. — In use.	Remarks.
Early Deep Scarlet..........	June 9....	June 30....	Came up slow and were stringy.
Scarlet Forcing	" 21....	" 30....	" "
Early Scarlet White-tipped..........	" 18....	" 30....	" "
Early Scarlet Turnip..........	" 18....	" 30....	" "
French Breakfast	" 21....	" 30....	" "
Olive-shaped Scarlet..........	" 18....	" 30....	" "

Winter Radish, sown May 9; pulled, October 22.
Black Spanish, large and smooth.
Scarlet China, medium smooth.

PARSLEY.

Champion Moss-curled, sown May 9; in use, July 15; good crop.

SUMMER SAVORY.

Sown, May 9; in use, July 16; good crop.

SAGE.

Sown, May 9; in use, July 16; did well.

SPINACH.

Victoria, sown May 14; very good crop.
Flat Seeded, sown May 14; very good crop.

RHUBARB.

Sown, May 14; transplanted, June 25.

Victoria.	All made good growth.
Myatt's Linnæus.	
Experimental Farm Seed:	
Scarlet Nonpareil.	
Monarch Seedling,	
Salt's Perfection.	
Tobolsk.	

Old beds in use, May 21 to September 30; good crop.

THE FLOWER GARDEN.

The flower garden was never better than the past season. While nearly all the flowers were good, Stocks, Asters and Pansies were extra fine. In the perennials, Paeonies and Irises were very good. Tulips were fine, but bloom was cut short by dry weather.

ANNUALS—Propagated in hot-house. Sown April 2.

Variety.	Set out.	Bloom. From	Bloom. To	Remarks.
Asters, 10 varieties	May 31	July 20	Oct. 1	Grand show.
Antirrhinum, 3 varieties	" 31	" 20	Sept. 26	Fair show.
Abronia Umbellata	June 1	" 10	" 15	Very good.
Ageratum, Dwarf Imperial	" 1	June 23	" 10	Fine border.
Alyssum maritimum	" 1	" 23	Oct. 20	Very fine.
Adonis	" 10	July 25	Sept. 10	Small red flower.
Alonsoa	" 2	" 5	" 25	Fair show.
Anagallis	" 2	" 23	....	Very fine flowers.
Balsam, Camellia-flowered	" 1	June 29	Frost	Very good.
Brachycome Iberidifolia	" 1	" 25	Sept. 20	Good border.
Bartonia Aurea	" 1	" 26	....	Fair show.
Chrysanthemum, 3 varieties	" 1	July 18	Oct. 1	Fair blooms.
Calliopsis	" 1	" 20	" 1	Very fine.
Calendula, Royal Marigold	" 1	June 29	" 20	Good blooms.
Candytuft, Empress	" 1	" 29	" 20	"
Clarkia	" 1	" 23	" 10	Very good.
Celosia, 2 varieties	" 1	......	....	Did not bloom.
Coreopsis, 3 varieties	" 1	July 18	Sept. 10	Fair blooms.
Dianthus, 8 varieties	" 1	" 10	Oct. 20	Very fine
Gaillardia picta Lorenziana	" 1	" 18	" 1	Good show.
Godetia, 4 varieties	" 1	" 10	" 1	"
Helianthus nanus	" 2	" 15	" 20	Very fine.
Helichrysum, 2 varieties	" 1	" 15	" 15	Fair show.
Hollyhock, double	" 2	" 10	" 20	Very good.
Iberis Gibraltarica	" 2	....	....	Did not bloom.
Kaulfussia, mixed	" 2	....	....	"
Linum gr. fl. roseum	" 2	July 20	Sept. 10	Some fine blooms.
Lobelia erinus, Crystal Palace	" 1	" 10	" 15	Very fine, good border.
Lupinus, mixed	" 1	" 20	" 20	
Mignonette	" 1	" 15	Oct. 10	Very good.
Mathiola bicornis	" 4	June 28	" 1	Fair show.
Nicotiana, 7 varieties	" 1	Aug. 15	Frost	Fine blossoms.
Nemophila Maculata	" 1	July 1	Oct. 20	Good border.
Nurembergia Gracilis	" 2	Aug. 5	Sept. 25	Fair.
Poppy, 5 varieties	" 1	" 1	" 25	"
Phacelia campanularia	" 1	July 25	" 16	Very good.
" grandiflora	" 1	" 25	" 16	"
Portulaca	" 1	June 25	" 19	Fine blooms.
Phlox Drummondii, 3 varieties	" 1	" 23	Oct. 20	Grand show.
Petunia, 4 varieties	" 1	July 10	Sept. 20	Extra fine.
Pansies, 8 varieties	" 1	June 20	Nov. 10	"
Scabiosa, 3 varieties	" 1	Aug. 1	Sept. 10	Fine show.
Sweet William	" 1	Biennial	Biennial	Did not bloom.
Salpiglossis variabilis	" 1	June 10	Oct. 1	Fine blooms.
Schizanthus, 2 varieties	" 1	" 23	" 1	"
Sanvitalia procumbens	" 2	July 15	Sept. 10	Not very good.
Stocks, 10 weeks	" 1	June 28	Oct. 20	Fine large blooms.
Tropaeolum, 5 varieties	" 1	July 12	" 5	Fair show.
Tagetes, 2 varieties	May 31	June 23	" 10	Good border.
Verbena hyb. auriculæflora	" 31	July 10	" 20	Very fine show.
Whitlavia gr. fl	June 2	" 1	" 1	Bloomed well.
Wahlenbergia	" 10	....	....	Did not bloom.
Zinnia elegans, 2 varieties	" 1	July 10	Oct. 1	Fine show.

ANNUALS.—Sown in the open, May 19.

Variety.	Bloom. From	Bloom. To	Remarks.
Alyssum, Sweet	Aug. 1	Oct. 20	Very good.
Asters	" 23	" 10	Poor.
Antirrhinum	" 4	" 10	Good.
Ageratum		" —	Did not grow.
Calliopsis	Aug. 8	" 1	Fair show.
Candytuft	July 10	Sept. 28	Good flowers.
Calendula	" 20	Oct. 10	"
Clarkia	" 20	" 10	Good.
Chrysanthemum	" 22	Sept. 24	Very fair.
Coreopsis	Aug. 20	Oct. 1	"
Eschscholtzia, 4 varieties	July 18	Sept. 24	Bloomed very fully.
Dianthus	Aug. 8	Oct. 10	"
Godetia	" 8	" 10	Fair show.
Helichrysum			Did not grow.
Marigold	July 24	Sept. 24	Fair show.
Mignonette	" 20	Oct. 10	Very good.
Phlox Drummondii	Aug. 2	" 20	"
Poppies	July 28	Sept. 26	Good.
Salpiglossis	Aug. 8	Oct. 1	"
Scabiosa	" 10	Sept. 10	"
Tropæolum	July 19	" 20	Good show.
Whitlavia	Aug. 1	" 24	"
*Sweet Pease, 33 varieties	July 26	" 28	Good succession of bloom.

*Sown May 10.

PERENNIALS.

The old beds of perennials, most of which were planted out in 1900, made very strong growth, and presented a fine succession of bloom throughout the season.

BULBS.

Tulips.—In flower from May 15 to June 2. Very fine, but suffered from the drought, which shortened the flowering period.

Dahlias.—Set out June 2; in flower July 18 till frost. The double ones were especially fine.

Gladioli.—Set out June 10; in flower August 8. Did well.

Iris.—Beds of Iris planted in 1900 bloomed freely from June 4 to July 19.

PAEONIES.

In flower from June 10 to July 15.

Last spring a large number of Japanese Iris, and some Cannas and Dahlias were sent up from the Central Experimental Farm, Ottawa. These were planted out and made satisfactory growth. A number of the Dahlias flowered very fully till September 17. Following will be found a list of those living at the close of the season.

JAPANESE IRISES.

Hana-aoi.
Momiji-no-taki.
Kumomano-sora.
Gold Bound.
Uji-no-hotaru.
Ho-o-jo.
Sofu-no-koi.
Shishi-ikari.
Kumo-isho.
Shichinkwa.
Violet Cap.
Mahogany.
Neptune.
Zenobia.
Kigan-no-misao.
Kasui-no-iro.
Samidare.
Shippo.
Oscar.
Shishi-odori.
Tsurugi-no-mai.

CANNAS.

Austria.
Baron de Poilly.
C. Bernardin.
Gladiator.
Mdlle. Berat.
Paul Marquant.
Pennsylvania.
Queen Charlotte.

DAHLIAS.

Aurata.
Bishop of Durham.
Clifford W. Bruton.
Constance.
Empress of India.
Ernest Glasse.
Gem.
Grand Duke Alexis.
Gilt Edge.
Herbert Turner.
Iridescent.
John Sladden.
John Cowan.
Lady H. Grosvenor.
Little Morris.
Lord Hawke.
Mantas la Villa.
Mrs. Wheeler.
Mrs. Dodds.
Mrs. Beedle.
Mammoth Queen.
Matchless.
Perfect Vallon.
Paragon.
Snowclad.
Snowflake.
Wm. Agnew.
Wm. Pearce
Woman in White.

In the Annual Report for 1903 a list of perennial flowers is given, most of which were sent from the Central Experimental Farm in 1900. Nearly all of these proved hardy. Included in this list was a number of varieties of iris, pæony and many other attractive perennials. Particulars as to the species and varieties tested will be found on pages 382-4 of that report.

TREES AND SHRUBS.

All trees and shrubs made large growth during the past season. All were well out in leaf by May 24, and no set-back took place up to the time of frost in September.

So rapid has been the growth of trees about fruit, and other garden plots, the last few years, that it has been found necessary to cut out in some cases, and cut back in many, the hedges surrounding these plots. While every season these hedges have been severely trimmed, they have outgrown such work, and are becoming an injury to all produce growing at all close to them. Maple and willow hedges are giving the most trouble in this respect.

Over 100,000 maple trees, in addition to a large number of shrubs have been taken up and heeled in for next spring's distribution.

ARBORETUM.

Three specimens of Populus Augustifolia were sent up from Ottawa last spring, and some cuttings of Basket Willow, which were planted out in the Arboretum. The Poplars took root readily and made strong growth, but the Willows were very slow in making a start, and had only made a weak growth at the close of the season.

All the other varieties of trees and shrubs under observation in the Arboretum, numbering about 300, a list of which was given in my report for 1903, made a better growth than usual. Many of the tender and half-hardy species were injured to a larger extent by the severe winter than they generally are, but the effects of this were soon overcome when the spring growth started.

The following trees and shrubs have done the best on the Indian Head Farm, and can be recommended for cultivation throughout the Territories:—

Botanical Name—	*Common Name—*
Acer Negundo.	Box Elder.
Acer Tataricum Ginnala.	Ginnalian Maple.
Alnus glutinosa.	Common Alder.
Betula populifolia.	White Birch.
Caragana arborescens.	Siberian Pea Tree.
Cornus stolonifera.	Red Osier Dogwood.
Cotoneaster integerrima.	Common Cotoneaster.
Crataegus chlorosarca.	
" coccinea.	Scarlet Haw.
" Crus galli.	Cockspur Thorn.
Fraxinus americana.	White Ash.
" pennsylvanica lanceolata.	Green Ash.
Lonicera Alberti.	Albert Regel's Honeysuckle.
" tatarica.	Tartarian Honeysuckle.
Populus balsamifera.	Balsam Poplar.
" deltoidea.	Cottonwood.
Rhamnus cathartica.	Common Buckthorn.
" frangula.	Breaking Buckthorn.
Ribes aureum.	Missouri Currant.
" Sibirica.	Siberian Currant.
Salix pentandra.	Laurel-leaved Willow.
" purpurea pendula.	Pendulous Purple Willow.
" Voronesh.	Voronesh Willow.
Syringa chinensis.	Rouen Lilac.
" Josikea.	Josika's Lilac.
" vulgaris.	Common Lilac.
Ulmus americanus.	American Elm.
Viburnum opulus.	Highbush Cranberry.

ARBORETUM.

The Arboretum was very attractive during the past season, and proved of interest to visitors at all times from the early spring till late in the fall. On account of the abundant rains, everything made extra strong growth.

FRUIT TREES.

Crab apples (Pyrus Baccata), Currants Red, White and Black, Raspberries Red and Black, and Gooseberries, gave fair crops of fruit this year. Plums were a poor crop, and none of the fruit ripened before frost came. Native fruit was destroyed by spring frosts.

I am sorry to report that considerable injury was done to many of the young cross-bred apple trees by rabbits last winter. When first noticed, tar-paper was tied about each tree, which protected them till the deep snow of March, when the rabbits were able to reach the branches. In some cases the young trees were entirely girdled.

PLANTING.

Last spring the following cross-bred apples and seedlings of cross-bred apples were received from the Central Experimental Farm, Ottawa, and planted:—

CROSS-BRED APPLES.

1 Manitou.
3 Alberta.
2 Dawn.
7 Tony.
2 Aurora.
4 Northern Queen.
2 Elsa.
2 Eve.
1 Bow.

SEEDLINGS OF CROSS-BRED APPLES.

5	seedlings of	Apple from Winnipeg.
19	"	Aurora.
11	"	Martha.
19	"	Alberta.
17	"	Tony.
12	"	Carleton.
7	"	Progress.
2	"	Cavan.
17	"	Pioneer.
1	"	Ruby.
2	"	Eve.
2	"	Hunter.
2	seedlings of	Columbia.
2	"	Olive.
2	"	Charles.
2	"	Carrie.
6	"	Prairie Gem.
10	"	Cluster.
6	"	Derby.
2	"	Parker.
12	"	Prince.
13	"	Sparta.
3	"	Eaton.
4	"	Eastman.

PLUMS.

Twelve seedlings of Mankato were received and set out.

STRAWBERRIES.

Twelve roots of each of the following varieties of strawberries were sent from the Central Experimental Farm and planted. A number of the roots died, but the others made fair growth:—

Greenville.
Enhance.
Crescent.
Daisy.
And Alpine Strawberries—
St. Antoine de Padowe.
St. Joseph.
Jean d'Arc.
Johnson's Early.
Bisel.
Daniel Boone.
Williams.

FRUIT CROP.

SIBERIAN CRAB. (PYRUS BACCATA.)

The Siberian Crabs planted in 1895 again bore large crops of fruit, which was ripe before frost came hard enough to injure them.

CROSS-BRED APPLES.

A number of the cross-bred apple trees set out in 1901 blossomed, and a few bore a fair crop of fruit, which much excelled the Pyrus baccata in both size and quality.

PLUMS.

A medium crop of fruit set, but owing to the unfavourable weather in August, it was very slow in maturing, and was frozen before any of it was ripe.

SAND CHERRIES.

A few varieties of sand cherry blossomed, and some fruit set, but it was poor and of little value.

SMALL FRUITS.

CURRANTS.

Red, White and Black Currants all bore a heavy crop of fruit of excellent quality. The cross-bred varieties set out in 1902 nearly all fruited this year. Following is a list of the varieties under test :—

Black.—Pomona, Stewart, Clipper, Black Victoria, Black Naples, Native Black, Perry, Eagle, Monarch, Charmer, Beauty, Ontario, Stewart, Ethel, Sterling, Standard, Orton, Star, Madoc, Climax, Kerry, Eclipse, Oxford, Winona, Lewis, Prince of Wales.

Red.—Fay's Prolific, Wilder, North Star, Raby Castle, Red Dutch, Cherry, Versaillaise, Fertile d'Angers, Prince Albert, Victoria.

White.—White Imperial, White Grape, White Dutch.

RASPBERRIES.

The first fruit that ripened was rather poor and dry, owing to the hot, dry weather, but the rains at the end of July caused the berries to fill out better, and a good crop was produced.

Marlboro, Miller, Dr. Reider, Kenyon Seedling, Caroline, Garfield, Mary, Turner, Hilborn Black and Older Black all fruited well.

GOOSEBERRIES.

Houghton and Smith's Improved produced a good crop of fruit. The young plants set out in 1902 and 1903 did not fruit.

STRAWBERRIES.

Vines all died in winter of 1902-3.

CATTLE.

The herd now consists of 48 head, 25 pure-bred Shorthorns and 23 grade animals. The bull, 'Arbor,' bred by E. Porter, Lowfield, Kirkby, Lonsdale, England, is at the head of the herd.

FEEDING TEST.

On November 7, 10 steers 1½ years old, and 8 steers 2½ years old, were purchased for feeding test. When tested for tuberculosis, two of each lot reacted. They were killed and examined, and the two young ones were found to be slightly, the two older steers seriously affected with tuberculosis.

Two steers raised on the farm were added, which brought the numbers up to 8 steers 1½ years old, and 8 steers 2½ years old.

It was desired to ascertain at which age the animals could be most economically fattened.

The test, which was for sixteen weeks, commenced on December 18, when the animals were divided into two lots, lot 1 comprising the 1½ year cattle, and lot 2 those aged 2½.

They were fed as follows:—

Lot 1. Each animal received per day:—Hay, 8 lbs.; ensilage, 15 lbs.; turnips, 10 lbs.

Meal was fed at the rate of 2 lbs. per head per day for first month, and increased 2 lbs. per head per day each month during the test.

Lot 2. Per head per day:—Hay, 12 lbs.; ensilage, 20 lbs.; turnips, 15 lbs.

Meal, 6 lbs each per day for first month, and increased by 2 lbs. each per day each month of test.

Turnips were only fed during the first half of test.

The meal used consisted of two parts barley, and one part small wheat.

Straw was also fed each lot, but account was not kept of the quantity consumed.

Before the test started the steers were fed the same ration as during the first month of test, and from end of test till sold, the same as during the last month of test.

Following will be found a statement of the monthly and total weights and gains of each lot during the test and till sold; the total amount and estimated value of the feed consumed from the time the steers were bought till they were sold; and a summary of the financial results of the transaction:—

MONTHLY and total weights and gains of each lot of steers.

Lot.	Weight at start of test.	1st 4 weeks.		2nd 4 weeks.		3rd 4 weeks.		4th 4 weeks.		Total gain during test.	Weight when sold.	Gain from end of test till sold, 11 days.	Total gain.
		Weight.	Gain.	Weight.	Gain.	Weight.	Gain.	Weight.	Gain.				
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Lot No. 1, 1½ years old...	6,900	7,100	200	7,410	310	7,690	280	8,010	320	1,110	8,120	110	1,220
Lot No. 2, 2½ years old...	9,150	9,570	420	10,060	490	10,460	400	10,940	480	1,790	11,190	250	2,040
Totals....	16,050	16,670	620	17,470	800	18,150	680	18,950	800	2,900	*19,310	360	3,260

* Sold less 5 per cent shrinkage, leaving net weight 18,345 lbs.

Total weight and estimated value of feed consumed during the whole period—November 7 to April 19:

PREPARATORY FEEDING, 41 DAYS.

Lot 1.

Hay, 2,624 lbs. at $5 per ton..........................	$ 6 56
Ensilage, 4,920 lbs. at $2 per ton..........................	4 92
Meal, 656 lbs. at ⅔c. per lb..........................	4 37
Turnips, 3,280 lbs. at 5c. per bushel..........................	2 73
	$18 58

Lot 2.

Hay, 3,936 lbs. at $5 per ton	$ 9 84
Ensilage, 6,560 lbs. at $2 per ton	6 56
Meal, 1,968 lbs. at ⅔c. per lb	13 12
Turnips, 4,920 lbs. at 5c. per bushel	4 10
	$33 62

Or for both lots, $52.20.

DURING TEST, 112 DAYS.

Lot. 1.

Hay, 7,168 lbs. at $5 per ton	17 92
Ensilage, 13,440 lbs. at $2 per ton	13 44
Meal, 4,480 lbs. at ⅔c. per lb	29 87
Turnips, 4,480 lbs. at 5c. per bushel	3 73
	$64 96

Lot 2.

Hay, 10,752 lbs. at $5 per ton	$ 26 88
Ensilage, 17,920 lbs. at $2 per ton	17 92
Meal, 8,064 lbs. at ⅔c. per lb	53 76
Turnips, 6,720 lbs. at 5c. per bushel	5 60
	$104 16

Or for both lots, $169.12.

FROM END OF TEST TILL SOLD, 11 DAYS.

Lot 1.

Hay, 704 lbs. at $5 per ton	$ 1 76
Ensilage, 1,320 lbs. at $2 per ton	1 32
Meal, 704 lbs. at ⅔c. per lb	4 69
	$7 77

Lot 2.

Hay, 1,056 lbs. at $5 per ton	$ 2 64
Ensilage, 1,760 lbs. at $2 per ton	1 76
Meal, 1,056 lbs. at ⅔c. per lb	7 04
	$11 44

Or for both lots, $19.21.

SUMMARY OF COST OF FEEDING.

Preparatory	$ 52 20
During test	169 12
Till sold	19 21
	$240 53

Cost of feeding Lot 1—$91.31, or $11.41 per head.
Cost of feeding Lot 2—$149.22, or $18.65 per head.

SUMMARY of Financial result of the Transaction.

Lot.	Price per head.	Amount paid.	Add cost of feed.	Total cost.	Weight sold.	At	Amount received.	Gain each lot.	Gain per head.
	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	cts.	$ cts.	$ cts.	$ cts.
No. 1	21 00	168 00	91 31	259 31	7,714	4	308 56	49 25	6 15
No. 2	29 50	236 00	149 22	385 22	10,631	4	425 24	40 02	5 00
Total	....	404 00	240 53	644 53	18,345	4	733 80	89 27	*

* Or an average net gain of $5.58 per head.

HORSES.

There are 13 horses, young and old, on the farm at present. Two of these are very old and of not much service, one of them having been brought up from Ontario when the farm was started in 1887.

During the summer, one of the driving horses died, and has not yet been replaced.

Last spring a fine colt was born, which keeps the number of horses the same as last year.

SWINE.

Three breeds are kept.—Berkshire, Tamworth and Yorkshire White. The two first breeds have done much the best the past season.

Since sending in my last report, 1 Berkshire boar and 1 sow, and 3 Tamworth boars and 3 sows have been sold to farmers for breeding purposes.

At the present date, November 30, there are 17 Berkshire, 19 Tamworth and 2 Yorkshire White pigs on the farm.

TEST OF PASTURING HOGS ON RAPE.

In compliance with a request of Dr. Elliott, Minister of Agriculture for the North-west Territories, a test was made during the past season of feeding some swine on rape, with the addition of a small quantity of meal.

One acre of corn land, ploughed the previous fall and harrowed, was sown with three pounds of rape seed, in drills 28 inches apart, on June 1. A good catch resulted and the rape made rapid growth. Up to July 19 the acre was scuffled twice, and all weeds in rows taken out by hoe. On July 19, a wire hog-fence was put around the lot, and a cross fence in the centre, cutting the acre in two. At this date the rape was meeting in the rows, when 10 pigs—5 Berkshire and 5 Tamworth grades were put in one of the half acres. Finding the pigs were making no impression on the rape, 7 pure bred Tamworths were added on July 23, when the test commenced.

The pigs were weighed when put in on September 23 and October 23, making a three months test. When taken from the half acre on October 23, one-third of the rape was still nearly meeting in the rows, and was afterwards eaten off by cattle.

During the first two months the swine were given 2,080 pounds of meal (oats and barley, half of each), which is equal to a little less than two pounds per head per day; in the third month they consumed 1,780 pounds, which equals three and a half pounds per head per day. Whether the rape had attained too rank a growth or not, before the pigs were put on, I cannot say, but during the entire period very little was

eaten, and for the first month no impression whatever was made on the half acre. Until the meal ration was materially increased the animals were always hungry.

I give below the weights of the pigs at the different dates, with the amount of gain made:—

	July 23. lbs.	Sept. 23. lbs.	Oct. 23. lbs.
17 pigs weighed	1,345	1,760	2,210
Gain		415	450
Average weight	79	103	130
Average gain		24½	26½

From July 23 to September 23 is 62 days, and from September 23 to October 23 is 30 days. It will be observed that after the quantity of meal was increased, the animals put on flesh more than twice as fast as before.

On the half acre on which no swine were pastured the yield of rape was 16 tons, or at the rate of 32 tons per acre. It attained a height of from two to three feet.

POULTRY.

Plymouth Rock, Light Brahma and Black Minorca fowls are kept on the farm. Eggs for setting and young fowls are sold to applicants as far as they can be supplied.

SEED GRAIN FOR DISTRIBUTION.

Early last winter two cars of 60,000 pounds each, of wheat, oats and barley were made up and shipped to Ottawa for distribution. In November this year, two more 60,000 pound cars loaded with wheat, oats, barley, pease, &c., were shipped to Ottawa.

In addition there is available for seed purposes, in excess of the requirements for the distribution from this farm a considerable quantity of grain which will be sold to settlers in lots of from two to six bushels, the large demand not permitting larger quantities to be sold to one applicant.

MEETINGS ATTENDED.

During last winter I attended, in company with Dr. Elliott, Minister of Agriculture for the Territories, Institute meetings at North Portal, Estevan, Weyburn, Yellow Grass and Milestone, on the Soo line. Other meetings had to be cancelled on account of snow storms.

In February a two-days stock-judging school was held in Indian Head, which I attended and assisted at as far as possible. Stock from the Experimental Farm was provided for the judging.

EXCURSIONS.

On June 16, the Regina fire brigade organized a large excursion from Regina and intermediate points to Indian Head, and large numbers visited the farm. Between 600 and 800 people thronged the gardens and other parts of the farm during the day.

On July 1, a very considerable number, 1,000 or more, drove or walked through the grounds from morning till late in the evening.

On July 12, the Orangemen of the surrounding districts met in Indian Head, and in great crowds inspected the farm throughout the day.

And on July 19, two large excursions, from Moosomin in the east to Moosejaw in the west, numbering over 1,500 people, and with an additional 300 or 400 from the town and district, spent the day on the farm. This excursion was under the auspices of the Department of Agriculture, Regina, and during the day, Dr. Elliott, Commissioner of Agriculture, and others, addressed the visitors. Mr. Gibson, manager of the creamery at Qu'Appelle Station, gave lessons in butter-making, and W. J. Black, B.S.A., of the *Farmer's Advocate*, gave valuable instruction in stock-judging, to a large and attentive audience. The weather was very fine, and the many visitors enjoyed the day greatly.

DISTRIBUTION OF SAMPLES.

During the months of March, April and May, the following distribution of samples of the products of the farm was made to applicants throughout the Territories of Assiniboia, Alberta and Saskatchewan.

As usual, it was only possible to supply about half the number of applicants, although the number of samples sent out was considerably larger than in previous years :—

Wheat	420 bags, 3 lbs. each.
Oats	542 "
Barley	367 "
Pease	176 "
Sundries (Flax, Rye and Spelt)	153 "
Potatoes	818 "
Tree Seeds, Maple	810 bags, ½ lb. each.
Tree Seeds, Caragana	900 packets.
Grass Seed, Brome	166 bags, 1 lb. each.
Grass Seed, Western Rye	66 "
Small Seeds	446 packages, containing 7,940 packages of shrub-seed, flower-seed, root-seed, garden-seeds and corn.
Rhubarb Roots	88 packages.
Fruit Bushes	186 "
Tree and Shrub seedlings	720 "
Express parcels containing Maple seedlings and other trees and shrubs	105 parcels.

CORRESPONDENCE.

During the twelve months ending October 31, 1904, 5,849 letters, irrespective of reports on grain and other samples, were received, and 5,871 letters, not counting circulars of instruction sent with samples, were mailed from this office.

METEOROLOGICAL.

Month.	Temperature, Maximum.		Temperature, Minimum.		Snow-fall.	Rainfall.		Hours of Bright Sunshine.
1903.	Date.	Degrees	Date.	Degrees	Inches.	No. of days.	Inches.	
November	2	73	19	—16	11	....	....	82·6
December	26	39	12	—27	14	....	....	75·8
1904.								
January	7	42	24	—47	8·5	....	....	81·4
February	29	32	10	—44	22·5	....	....	120·3
March	30	38	11	—26	33	....	....	113·3
April	28	72	7	7	3·5	3	·19	165·8
May	20	78	24	24	....	9	1·94	165·6
June	18	90	4	34	....	13	2·74	221·7
July	23	92	26	38	....	8	3·81	299·5
August	26	86	27	33½	....	11	1·17	210·8
September	7	80	19	24	....	10	1·79	146 6
October	30	69	25	18	....	3	·32	145·8
					92·5	57	11·96	1,829·2

I have the honour to be, sir,

Your obedient servant,

ANGUS MACKAY,

Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., November 30, 1904.

To Dr. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit the following report of the work done and progress made on the Experimental Farm at Agassiz during the year 1904.

The season while in some respects peculiar, has been on the whole, a favourable one.

The winter was mild, the lowest temperature recorded at this station in January, being 15, with a snowfall for the month of four inches and six and a quarter inches of rain. February, the coldest was 17 degrees of frost and nearly nine inches of rain and thirty-two inches of snow.

There was less rain and snow in March, the fall being 5¼ and 6½ inches respectively, and the coldest was 30 on two occasions, but the prevailing winds were north-west and north-east and there was very little progress in vegetation.

A temperature of 30 with a sharp frost on April 29 caught many of the fruit trees in bloom and a good deal of the bloom fell off, especially in the case of the plums.

The weather turned drier in May, the rainfall for the month being less than 2½ inches, which is much lower than usual, but the winds were cool and growth very backward.

June remained cool and although the rainfall was a little heavier than that of May, yet the grass and clover began to show need of more rain.

In July the rainfall was light and the weather became warm and growth was rapid, except in clover fields where the second crop had been cut, corn and all sorts of grain made rapid progress. The weather continued bright and warm throughout August, September and October with very light rainfall, very fine for harvest and all other farm work but almost too dry for root crops.

On the whole, the season, although rather dry during most of the summer has been very favourable for farm work, and even root crops, where the soil was kept stirred, have been satisfactory, and the weather for harvesting them exceptionally fine. Up to the present date we have not had a killing frost, roses and sweet pease being still in bloom in the open garden.

FRUIT CROP.

The continued wet weather in May and early June damaged the cherry crop and to some extent injured the strawberry crop, but with clearer, warmer weather the larger fruits had a better chance. Plums and pears were light in many orchards owing to the frost in last of April, and the cool weather in April and May, but the sample was fine and there was less rot in the plums than usual. The apples, too, were freer from skin diseases, and owing to the bright sunny autumn were better coloured and finer than usual.

HEDGES.

Many people are making inquiries as to the best hedges. In evergreens, wherever it will stand the climate the holly makes a very handsome hedge, making a close com-

pact growth and, when old enough to produce berries, the glossy green leaves and bright red berries make it a thing of beauty.

The eastern hemlock, eastern arborvitae, Norway spruce, pyramidal arborvitae, and the native cedar all make very compact handsome hedges which look well always.

For flowering hedges, the weigelias, deutzias, Japan quince or Japanese snowball all look well when in bloom.

ORNAMENTAL TREES AND SHRUBS.

There was a heavy fall of soft damp snow in February which clung to the trees and shrubs and some were crushed and injured, but none so much as to ruin them, with this exception, the growth has been very strong and many of the flowering trees and shrubs never looked better than they did this year. In flowering trees the double flowering thorns, pink, scarlet and white, the laburnum, and the flowering dogwood, pink and white, grow luxuriantly and flower profusely.

In shrubs the Japanese quince and Japanese snowball, the weigelias, spiraeas, hydrangeas, syringas, deutzias, philadephus and many others make a fine display of bloom from the last of March until June, and many of the shrubs and trees having variegated or purple foliage make a strikingly handsome appearance all summer.

The timber and nut trees in the forest belt continue to grow and thrive, and many of the trees planted on the mountain side are getting above the underbrush, and when the trees get their autumn tints are distinctly noticeable.

NUT TREES.

The English and American black walnuts each produced a few nuts, and the Japanese walnut a fine crop. The chestnuts also, many of them, had a fair crop of nuts. Many requests for nuts and tree seeds are received from farmers throughout the province, and reports coming in of the nuts distributed in former years show that there is a live interest being taken in nut tree growing, as the trees when once well established, make a rapid growth and soon become handsome shade trees as well as nut producers. The filberts of all the nut producers are unsatisfactory, the crop on all the varieties being very poor, and the bluejays begin to carry them off before they are properly filled.

DITCHING.

Considerable ditching has been done during the year, and the old ditches where open have been cleaned out, and many of the wet places along the foot of the mountains are now dry and will be cleared of brush and put under cultivation and pasture as rapidly as possible.

NEW BREAKING.

About 8 acres have been ploughed and disked, and are now being ploughed again to be in readiness for a crop next year.

LIVE STOCK.

The cattle here are all registered short-horns, and the herd consists of 9 cows, 4 heifers, 3 bulls and 7 calves, 4 of these are bull calves, and 3 heifer calves. One shorthorn cow was sold for beef, as she proved to be barren. One of the bull calves mentioned in my report last year has been sold as a breeder and the other is on hand.

SHEEP.

The flock at present consists of fifteen ewes and ewe lambs, and six rams. Three ewes were lost since my last report, one died of old age, and the other two from unknown causes, as the flock has been at all times healthy. Two barren ewes and two rams were sold to the butcher, and one ram for a breeder. The Dorset Horned sheep appear to make a satisfactory cross with the common sheep, buyers being pleased with the results, and butchers say that the grade lambs dress very well.

PIGS.

The stock now on hand consists of two Yorkshire White sows and a Yorkshire Write boar, all very fine individuals, and six young pigs of this breed. A Berkshire boar, three young sows and seven pigs, all fine thrifty animals.

HORSES.

The horse stock is the same as last year, but an effort is being made to get a young eavy team, as the area under cultivation is getting greater and more team force is ecessary.

Young heavy teams are very scarce, but it is hoped that before the work comences in spring a team will be got.

BEES.

Seven swarms of bees were taken into winter quarters, but three of them died beore spring, and the others were much reduced in strength when spring opened. Three ine swarms have been saved this season, and there are now seven strong colonies which re well supplied with honey to carry them over the winter.

FOWLS.

There are now on the farm five breeds of fowls, Black Minorcas, Rose Comb Brown Leghorns, B. P. Rocks, Brahmas and Buff Orpingtons. As in former years, the Black Minorcas have been the best layers, and their eggs are large; the R. C. Brown Leghorns laid nearly as many eggs as the Black Minorcas, but their eggs were smaller.

Of the last three named breeds, the B. P. Rocks are the best layers.

Brahmas and Buff Orpingtons are about equal with us as layers, but the B. P. Rocks and Buff Orpingtons mature earlier than the Brahmas and all three breeds are good sitters, and good mothers, and are profitable as layers until two and a half years old, when they are apt to get too fat and lay fewer eggs.

The hens are kept in breeding pens, with yards attached, from January 1 to July 1. During the rest of the year they are allowed to run at large.

They are seldom troubled with any disease except sometimes a little rheumatism, which is caused by the wet weather; but crows, hawks and skunks carry off a good many chickens, even after they are well grown.

We have had an average of 60 per cent of chickens from eggs put into the incubator. These chickens are raised in a brooder, which is kept in a brooder-house, and have been strong and thrifty, but they have not been either stronger or healthier than chickens hatched and raised by hens, nor has the per cent of loss been greater from any cause.

The hens are fed mixed grains, $\frac{3}{4}$ wheat, $\frac{1}{8}$ oats and $\frac{1}{8}$ pease, sunflower seeds in the autumn, and during the coldest weather in winter they get once a day boiled roots and chop mixed, and a cabbage head or some vegetable always before them.

The hen-house is whitewashed several times a year. The roosts and nest boxes are movable, so as to be easily cleaned and renewed, and they are given clean chaff or straw on a swept floor once a week.

EXPERIMENTS WITH OATS.

Forty-three varieties of oats were sown on one-fortieth of an acre plots. The soil was a sandy loam, in fair condition, having been in corn the previous year and the corn had been planted on clover stubble with a luxuriant aftergrowth of clover turned under. The mountain close on the east side of the field and a fir wood on the west deprived it of the early morning and evening sunshine, and perhaps on this account aided the spread and growth of rust, which was more or less in evidence in all the varieties, and which lessened the yield to a considerable degree. All were sown April 16.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw	Yield per Acre.		Weight per Bushel.	Rusted
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Golden Fleece.......	Aug. 8	114	44	Medium..	10	Branching..	5,520	67	2	36	Slightly.
2	White Giant	" 13	119	46	" ..	9	" ..	5,400	61	16	35½	"
3	Thousand Dollar	" 11	117	42	" ..	10	" ..	5,200	61	6	38	Consid'ably.
4	Holstein Prolific.....	" 8	114	40	Strong....	10	" ..	5,840	60	20	34½	"
5	Irish Victor..........	" 12	118	40	Medium..	10	Sided.......	5,520	60	10	36	
6	Kendal White........	" 13	119	42	" ..	8	Half sided..	5,680	59	24	36	Badly.
7	Pense Black	" 12	118	46	" ..	9	Branching..	5,680	59	14	35½	"
8	Banner.	" 8	114	44	" ..	10	" ..	5,800	59	4	36	Slightly.
9	Olive Black.	" 12	118	44	" ..	8	Sided... ..	5,840	58	28	35¼	"
10	Improved Ligowo. ..	" 8	114	46	" ..	9	Branching..	5,600	58	18	36½	"
11	Buckbee's Illinois. ..	" 12	117	44	" ..	9	" ..	5,400	58	8	35	Badly.
12	Improved American.	" 13	119	46	" ..	9	" ..	5,600	57	32	34½	Slightly.
13	Lincoln.	" 13	119	46	" ..	10	" ..	5,920	57	22	35½	Badly.
14	Tartar King.........	" 10	116	44	" ..	9	Sided.......	5,840	57	22	35½	Slightly.
15	Waverley............	" 10	116	44	Stiff	10	Branching..	5,800	57	2	35	"
16	Kendal Black	" 13	119	42	Medium..	10	Sided......	5,800	56	26	34½	Badly.
17	Abundance..........	" 13	119	40	" ..	9	Branching..	5,360	56	26	36	"
18	Olive White.........	" 12	118	46	" ..	9	Sided.	5,680	56	16	35½	Consid'ably.
19	Pioneer.	" 9	115	42	" ..	9	Branching..	5,520	56	16	35	Badly.
20	Bavarian.	" 8	114	44	" ..	9	" ..	5,600	56	6	35	Slightly.
21	Siberian......	" 11	117	42	" ..	10	" ..	5,600	55	30	35½	Badly.
22	American Triumph..	" 8	114	42	Stiff..	9	" ..	5,520	55	20	35½	Consid'ably.
23	Pense White	" 9	115	38	Medium..	10	" ..	5,600	55	10	34	Badly.
24	Wide Awake..	" 12	118	40	" ..	9	" ..	5,600	54	24	35	"
25	Twentieth Century ..	" 12	118	40	" ..	11	" ..	5,800	54	14	34½	Slightly.
26	Joanette.............	" 11	117	40	" ..	9	" ..	5,520	54	4	36	"
27	Black Beauty........	" 8	114	44	" ..	10	" ..	5,600	53	28	35	Badly.
28	Milford White	" 12	118	44	" ..	9	Sided.......	5,520	53	18	35½	"
29	Storm King.........	" 8	114	46	" ..	11	"	5,920	52	32	36½	Consid'ably.
30	Swedish Select	" 9	115	46	" ..	9	Branching..	5,120	52	27	35	"
31	Golden Giant.........	" 15	121	44	" ..	9	Sided.......	5,680	52	22	34¾	Badly.
32	Golden Tartarian....	" 15	121	42	Stiff.	11	"	5,840	52	12	35	Consid'ably.
33	Scotch Potato.	" 13	119	40	Medium..	10	Branching..	5,840	51	26	35½	Slightly.
34	Danish Island.......	" 9	115	42	" ..	9	" ..	5,760	51	16	36	"
35	Swedish Probstey. ..	" 10	116	46	" ..	9	" ..	5,920	51	6	36	Badly.
36	American Beauty....	" 15	121	41	" ..	10	" ..	4,960	50	30	35	"
37	Mennonite..........	" 9	115	44	" ..	10	" ..	5,600	50	25	35	Slightly.
38	Early Golden Prolific.	" 9	115	40	" ..	9	" ..	5,440	50	20	35	"
39	Columbus.	" 12	118	41	Weak	8	" ..	5,400	50	10	36	Badly.
40	Golden Beauty......	" 13	119	42	Medium..	10	" ..	5,600	50	..	34½	"
41	Milford (black)	" 8	114	38	" ..	8	" ..	5,400	49	24	35	"
42	Goldfinder	" 13	119	40	" ..	9	" ..	5,360	48	28	34½	Consid'ably.
43	Sensation.	" 12	118	46	" ..	11	" ..	5,840	47	22	35	"

EXPERIMENTS WITH BARLEY.

Thirty-five varieties of barley were sown this year, twenty of which were six-rowed sorts, and fifteen two-rowed. The land for this test was a sandy loam which had been in clover and was top dressed in the spring of 1902 with about twelve tons of barn-yard manure, a heavy growth of clover was ploughed under in the fall of that year and repeatedly disked and harrowed in the spring of 1903, and a crop of potatoes grown on it, which left it in good condition for barley this season. The yields have been fairly good, and owing to bright, dry harvest weather, the sample is good. The plots were all one-fortieth of an acre and all sown April 23. There was no rust or smut on any of the varieties grown.

SIX-ROWED BARLEY—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.		Yield per Acre.		Weight per Bushel.
			In.		In.		Tons.	Lbs.	Bush.	Lbs.	Lbs.
Albert	Aug. 4	102	38	Medium	3	Six-rowed	3	1,520	63	36	48¾
Mensury	" 4	102	38	Strong	3	"	3	1,720	62	24	48½
Claude	" 4	102	36	Medium	3	"	3	1,320	60	40	48¼
Oderbruch	" 2	100	42	Strong	3	"	4	..	58	6	48¼
Brome	" 6	104	39	Medium	3	"	3	1,640	57	24	49
Odessa	" 1	99	44	Strong	3	"	3	720	57	14	48
Common	" 4	102	36	Medium	3	"	3	1,200	56	12	48½
Empire	" 5	103	40	Strong	3	"	3	1,600	55	20	48½
Argyle	" 5	103	40	Medium	3	"	3	1,320	55	..	49
Baxter	" 2	100	36	"	2½	"	3	1,240	54	28	48¼
Stella	" 12	110	36	"	2½	"	3	520	53	26	48¼
Champion	" 1	99	38	"	2½	"	3	1,440	53	6	48
Garfield	" 5	103	38	"	2½	"	3	1,420	51	12	48½
Trooper	" 14	112	38	Strong	3	"	3	760	50	50	48¼
Summit	" 10	108	39	Medium	3	"	3	1,200	50	40	48½
Mansfield	" 6	104	38	"	2½	"	3	1,400	48	36	48
Yale	" 13	111	40	"	2½	"	3	1,600	48	26	48¼
Nugent	" 11	109	44	"	3	....	3	1,420	47	24	48¼
Royal	" 9	107	40	"	3	....	3	1,720	46	12	48
Rennie's Improved	" 2	100	40	"	3	....	3	1,520	45	..	48

TWO-ROWED BARLEY—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.		Yield per Acre.		Weight per Bushel.
			In.		In.		Tons.	Lbs.	Bush.	Lbs.	Lbs.
Logan	Aug. 10	109	40	Bright & stiff	3½	two-rowed	3	1,600	67	44	49
Danish Chevalier	" 12	111	40	"	3½	"	3	1,360	56	32	49
Sidney	" 13	112	43	Medium	3½	"	3	1,720	56	22	48
Canadian Thorpe	" 10	109	41	"	3½	"	3	320	56	·2	49
Standwell	" 13	112	43	"	3	"	4	400	56	12	48
Jarvis	" 11	110	46	Strong	3½	"	3	1,840	52	24	48½
French Chevalier	" 12	111	47	Medium	4	"	3	1,720	52	4	49½
Gordon	" 8	107	40	"	3	"	3	1,120	51	12	49
Beaver	" 10	109	44	"	3	"	3	1,400	50	20	49
Newton	" 13	112	40	Strong	3	"	3	1,280	50	10	48½
Fulton	" 9	108	40	Medium	3	"	3	1,440	50	..	49
Dunham	" 9	108	43	"	3½	"	3	1,480	49	8	48½
Harvey	" 8	107	38	"	3	"	3	1,600	48	16	48½
Invincible	" 11	110	42	Strong	3	"	3	1,400	46	12	48
Clifford	" 9	108	44	"	3	"	3	1,840	45	40	48

EXPERIMENTS WITH SPRING WHEAT.

Thirty-six varieties of spring wheat were tested in plots of one-fortieth of an acre each. The land was a sandy loam, had been in grass for two years, followed by corn in 1903, and although the yields are not heavy the sample is good as it had fine dry weather for harvest. The plots were sown at the rate of one and a half bushels per acre. All the plots were sown April 25, and were free from rust or smut.

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.	
				In.		In.		Lbs.	Bush.	Lbs.
1	White Fife	Aug. 18..	115	46	Stiff	3	Beardless.	5,400	33	20
2	White Russian	" 19..	116	48	"	4	"	5,800	32	40
3	Wellman's Fife	" 19..	116	46	Medium..	3	"	5,600	32	..
4	Red Fife	" 17..	114	48	Stiff	3	"	5,800	32	..
5	Stanley	" 17..	114	48	"	3½	"	5,800	31	20
6	Minnesota No. 163	" 16..	113	41	"	3½	"	5,700	30	10
7	Admiral	" 16..	113	48	"	3½	"	5,600	30	..
8	Benton	" 18..	115	44	Medium..	2½	"	6,080	29	..
9	Percy	" 13..	110	46	Stiff	3	"	4,520	28	40
10	Hayne's Blue Stem	" 16..	113	48	"	3½	"	5,840	28	20
11	Countess	" 12..	109	44	"	4	"	6,600	27	40
12	Powers' Fife	" 17..	114	43	"	3	"	5,520	27	30
13	McKendry's Fife	" 16..	113	42	Medium..	3	"	5,400	27	20
14	Laurel	" 16..	113	42	"	3	"	5,600	27	20
15	Australian No. 9	" 17..	114	46	Stiff	3	"	5,800	27	10
16	Byron	" 17..	114	48	"	3	Bearded..	5,680	27	..
17	Clyde	" 18..	115	40	"	3	Beardless.	6,320	26	50
18	Preston	" 13.	110	46	"	3	"	5,480	26	40
19	Weldon	" 18..	115	46	Medium..	3	"	5,600	26	30
20	Huron	" 15..	112	44	Stiff	3½	Bearded..	6,080	26	..
21	Monarch	" 18..	115	45	"	3	Beardless.	5,680	25	50
22	Hungarian	" 16..	113	46	"	3½	Bearded..	6,000	25	40
23	Chester	" 18..	115	42	Medium..	3	Beardless.	6,200	25	20
24	Plumper	" 16..	113	42	Stiff	3	Bearded..	6,400	24	20
25	Australian No. 19	" 15..	112	48	"	3½	Beardless.	5,680	24	..
26	Rio Grande	" 17..	114	44	Medium..	3½	"	6,000	23	40
27	Crawford	" 13..	110	46	"	3	"	5,600	23	20
28	Colorado	" 13..	110	44	Stiff	3½	Bearded..	6,400	23	..
29	Red Fern	" 18..	115	43	Medium..	3½	"	5,810	22	50
30	Pringle's Champlain	" 16..	113	42	"	3	Beardless.	5,560	22	40
31	Advance	" 15..	112	46	Strong	3	Bearded..	5,520	22	20
32	Herisson Bearded	" 18..	115	40	Weak	3	"	5,480	22	..
33	Dawn	" 15..	112	48	Stiff	3½	Beardless.	5,000	20	40
34	Hastings	" 15..	112	42	"	3½	"	5,680	18	40
35	Early Riga	" 11..	108	40	Weak	2½	"	5,000	18	..
36	Fraser	" 13..	110	48	Stiff	3	Bearded..	5,600	17	20

MACARONI WHEAT.

Four varieties of this class of wheat were sown in plots of the same size alongside of the bread wheat plots. The yields are fairly good, but not better than in the regular classes, and as all of them are heavily bearded, they are not better than in become popular. There was no rust or smut in any of these plots.

MACARONI WHEAT—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Proportion Rusted.
			In.		In.		Lbs.	Bush.	Lbs.	
Goose	Aug. 15.	112	47	Stiff and bright..	3½	Bearded	6,400	29	20	No rust or smut.
Mahmoudi	" 20.	114	48	" ..	3½	" ..	5,600	28	..	"
Yellow Gharnovka..	" 19.	116	46	" ..	3	" ..	5,440	26	40	
Roumanian	" 17.	114	48	" ..	3½	" ..	5,300	26	..	

EMMER AND SPELT.

Four plots of this class were sown alongside of the wheat plots. The yields are very fair and the straw is bright and clean, and is eaten by cattle as a change in their rations, more readily than wheat or oat straw. From reports of samples sent to the dry parts of the interior it has in each case given satisfactory yields, but the bearded sorts are disliked.

EMMER AND SPELT—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Weight of Grain as threshed.
			In.		In.		Lbs.	Lbs.
Common Emmer	Aug. 20..	117	36	Weak	2	Bearded	5,360	1,920
Red Emmer	" 20..	117	40	Strong	3	"	5,600	1,840
Red Spelt	" 19..	116	40	Medium	3½	Beardless	5,840	1,680
South Dakota No. 524	" 18..	115	38	"	2½	Bearded	5,680	1,660
White Spelt	" 20..	117	38	"	5	Beardless	5,240	1,590
South Dakota No. 3..	" 19 ..	116	36	Weak	2	Bearded	5,520	1,470

PEASE.

Thirty-three varieties of field pease were tested this year. They were sown on sandy loam which had a heavy growth of clover turned under. The land was in apple orchard and although a strip of six feet on each side of the rows of apple trees was left unsown, yet the shade of the trees injured the crop and lessened the yield. The clear dry weather at harvest time allowed the crop to be harvested in good condition.

The following is a statement of the yields computed from plots of one-fortieth of an acre each.

PEASE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		Number of Days Maturing.	Character of Growth.	Length of Straw.	Weight of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
						In.	Lbs.	In.		Bush.	Lbs.	Lbs.
1	Kent	Aug.	15	122	Strong	52	5,600	3	Large	40	.	62½
2	Macoun	"	16	123	"	51	5,400	2½	"	38	50	62
3	Canadian Beauty	"	11	118	"	56	5,200	3	"	38	40	61
4	Daniel O'Rourke	"	9	116	Medium	40	5,040	2½	Small	38	40	61½
5	German White	"	9	116	Strong	56	5,400	3	Medium	38	30	63
6	Duke	"	16	123	"	58	5,680	2½	Large	37	30	60½
7	White Marrowfat	"	15	122	"	50	5,640	3½	"	37	20	60
8	Victoria	"	16	123	Medium	48	5,360	3	Medium	36	40	61
9	Early Britain	"	9	116	"	50	5,400	3	"	35	40	62
10	English Grey	"	13	120	"	56	5,520	3	"	35	30	60
11	Prince	"	15	122	Strong	46	5,200	3	Large	35	20	60½
12	Wisconsin Blue	"	12	119	Medium	60	5,280	2½	Small	34	40	61
13	Gregory	"	13	120	Strong	58	5,200	3	Medium	34	20	60
14	Mummy	"	12	119	Medium	56	5,600	3	"	34	..	61½
15	Crown	"	8	115	"	54	5,440	3	Small	33	20	61½
16	Pride	"	10	117	Strong	54	5,600	3	Large	33	..	61
17	Mackay	"	14	121	"	56	5,600	3	Medium	32	50	60½
18	Prussian Blue	"	9	116	"	48	5,520	3	"	32	40	60
19	Paragon	"	16	123	"	58	5,200	3	"	32	30	61
20	Carleton	"	12	119	"	60	5,680	2½	"	32	20	62
21	King	"	12	119	"	54	5,440	3	Large	32	10	60½
22	Black-eyed Marrowfat	"	9	116	"	50	5,720	3	"	32	..	60
23	Nelson	"	12	119	"	56	4,800	3	Medium	30	40	61
24	White Wonder	"	8	115	Medium	56	5,840	2½	"	30	30	61½
25	Prince Albert	"	13	120	"	48	5,200	2½	Small	30	20	62
26	Pearl	"	16	123	Strong	68	5,320	3	Large	29	20	61
27	Arthur	"	13	120	"	50	5,690	3	"	28	40	62½
28	Canadian Beauty	"	11	118	"	56	5,200	3	Very large	28	30	61¾
29	Golden Vine	"	10	117	Medium	56	5,920	2½	Small	28	10	61¾
30	Picton	"	16	123	Strong	50	5,000	3	Medium	28	..	60½
31	Archer	"	16	123	Medium	50	5,240	2½	"	27	20	60
32	Agnes	"	13	120	Strong	55	5,360	3	"	27	10	62
33	Chancellor	"	16	123	"	54	5,280	3	"	26	40	62

EXPERIMENTS WITH INDIAN CORN.

Nineteen varieties of corn were tested this year on soil which was quite sandy. This had been in wheat the previous year, and with the wheat about 10 lbs. of red clover seed was sown. The clover made a strong growth after the wheat was harvested, and was ploughed under early the following spring, and harrowed several times before the corn was planted. As in previous years, all the varieties were tested in drills three feet apart in the drill, and the corn thinned to about six inches apart, and in hills three feet apart each way, and about three plants in the hill. In this district where there is as a rule plenty of rain all summer, and a great deal of foliage on the stalks, we have generally found a better development of ears when grown in hills, and where there was corn on the ear it was more matured than that in the rows. Further, the hills give more room for air and sunlight, and a better chance to fight the weeds, as the horse hoe can be used both ways. This probably more than compensates for the larger crops secured from

the drills. All the plots were sown May 20, and cut October 8, 10 and 11. Four rows one hundred feet long were planted, and the weight per acre computed from the crop obtained from 66 feet of the two centre rows in each case.

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	When Tasselled.	In Silk.	Early Milk.	Condition when out.	Weight per Acre grown in Rows.		Weight per Acre grown in Hills.	
						Tons.	Lbs.	Tons.	Lbs.
1	Compton's Early	Aug. 18	Aug. 24	Sept. 20	Roasting ear	19	1,840	15	360
2	Superior Fodder	Sept. 4	Sept. 20	....	Ears formed	18	88	15	800
3	Salzer's All Gold	" 10	" *28	....	In silk	16	1,440	15	1,240
4	Mammoth Cuban	" 12	" 30	....	"	16	560	10	1,240
5	Eureka	Aug. 28	" 14	Oct. 6	Early milk	14	600	15	800
6	Angel of Midnight	" 24	" 10	Sept. 30	"	14	490	11	1,800
7	Giant Prolific Ensilage	Sept. 1	" 20	Oct. 6	"	13	1,500	14	1,480
8	Red Cob Ensilage	Aug. 28	" 1	Sept. 20	Late milk	13	1,500	13	620
9	Early Butler	" 24	" 5	" 30	Early milk	13	400	11	110
10	Cloud's Early Yellow	" 18	" 7	" 24	Late milk	12	240	13	180
11	Champion White Pearl	Sept. 4	" 20	Oct. 1	Early milk	11	1,540	13	400
12	Pride of the North	" 1	" 14	" 8	"	11	1,430	12	90
13	White Cap Yellow Dent	" 1	" 15	Sept. 30	"	10	1,560	11	1,980
14	Longfellow	Aug. 18	" 3	" 20	Late milk	10	1,120	9	1,800
15	King Philip	" 16	" 14	Oct. 8	Early milk	10	20	9	700
16	Selected Leaming	" 28	" 22	" 1	"	9	1,800	10	240
17	Early Mastodon	Sept. 4	Oct. 1	....	In silk	9	1,690	8	1,820
18	North Dakota White	Aug. 26	Sept. 12	Oct. 8	Early milk	7	300	8	1,380
19	Evergreen Sugar	Sept. 6	" 20	" 1	"	5	670	5	10

EXPERIMENTS WITH TURNIPS.

Twenty-five varieties of turnips were tested this year. The land was a sandy loam which had given a crop of wheat in 1902, and was seeded with clover with the wheat, top dressed with about 12 tons of barnyard manure per acre in the winter of 1902 and 1903. The clover, which was a fine stand, was mown twice in 1903, and a fine aftermath turned under in November of 1903. It was disked and harrowed, and given another light dressing of stable manure in early spring. This was well worked into the soil with disk and drag, and the land was in good condition when the seed was sown. Two sowings of each sort were made, the first May 13, and the second May 27. Had the season been a normal one there would doubtless have been a heavy yield. All were sown on the flat in drills, four rows of 100 feet length, 30 inches apart, were sown in each test, and the yield per acre computed from 66 feet of the two centre rows. All were harvested October 24.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre.—1st Plot.		Yield per Acre.—1st Plot.		Yield per Acre.—2nd Plot		Yield per Acre.—2nd Plot	
						Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Carter's Elephant					40	685	1,344	45	31	205	1,036	45
2	Halewood's Bronze Top...					39	870	1,314	30	32	1,670	1,094	30
3	Elephant's Master					38	1,550	1,292	30	34	640	1,144	.
4	Bangholm Selected........					37	1,900	1,265	..	35	609	1,176	40
5	East Lothian.............					34	1,940	1,165	40	40	520	1,342	..
6	Prize Purple Top.........					34	1,305	1,155	05	29	1,940	1,166	40
7	Perfection Swede.........					34	1,140	1,152	20	31	1,360	1,056	..
8	Skirvings................					30	390	1,006	30	38	1,220	1,287	..
9	Magnum Bonum					28	1,750	962	30	31	40	1,036	45
10	Drummond Purple Top...					28	100	935	..	23	860	781	.
11	Kangaroo					26	470	874	30	25	490	841	30
12	Good Luck.					26	305	871	45	24	1,005	816	45
13	Selected Purple Top......	May 13	May 27	Oct. 24	Oct. 24	25	1,480	858	..	23	1,190	786	30
14	Imperial Swede....					25	1,315	855	15	25	820	847	..
15	Hall's Westbury					25	820	847	..	21	900	715	.
16	Jumbo.......					24	1,005	816	45	20	790	679	50
17	Improved Elephant.......					24	510	808	30	21	900	715	..
18	Mammoth Clyde					23	1,190	786	30	22	880	748	..
19	Queen..................					23	200	770	..	21	1,890	731	30
20	Emperor Swede					22	1,870	764	30	31	1,535	1,058	45
21	Empress					22	1,375	756	15	24	1,170	819	30
22	Sutton's Champion					22	880	748	..	31	1,360	1,056	..
23	Hartley's Bronze					22	220	737	..	21	1,230	720	30
24	Bronze Globe					20	425	673	45	24	1,830	830	30
25	New Century					19	115	635	15	18	1,620	627	..

EXPERIMENTS WITH CARROTS.

Ten varieties of carrots were included in the test this year. As in the other root tests, two separate sowings were made of each variety. The first sowing was made April 25, and the second two weeks later, on May 9. As in previous years, the intermediate or Vosges sorts yield better than the long sorts, and are much easier and consequently cheaper to harvest, and less liable to be broken in handling. Four rows of each sort, each 100 feet long, were sown, and the yield per acre computed from the yield of 66 feet of the two centre rows. These test plots were alongside of the mangels and the soil conditions were the same. The drills were 30 inches apart. All were harvested October 24.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot	
						Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Giant White Vosges	April 25	May 9	Oct. 21	Oct. 24	21	1,232	720	32	19	610	643	30
2	Carter's Orange Giant...	" 25	" 9	" 24	" 24	17	650	577	30	9	975	316	15
3	Mammoth White Intermediate	" 25	" 9	" 24	" 24	13	520	442	..	13	400	440	..
4	Ontario Champion	" 25	" 9	" 24	" 24	13	355	439	15	11	1,760	396	..
5	Early Gem	" 25	" 9	" 24	" 24	13	460	440	..	12	585	409	45
6	Long Yellow Stump Rooted	" 25	" 9	" 24	" 24	12	1,080	418	..	11	440	374	..
7	White Belgian..........	" 25	" 9	" 24	" 24	11	1,760	396	..	10	1,780	363	..
8	New White Intermediate	" 25	" 9	" 24	" 24	11	770	379	30	10	955	349	15
9	Improved Short White...	" 25	" 9	" 24	" 24	9	1,460	324	20	11	605	376	45
10	Half Long Chantenay...	" 25	" 9	" 24	" 24	8	1,820	297	..	8	5	266	45

EXPERIMENTS WITH MANGELS.

Eighteen varieties of mangels were tested this season. Two sowings of each sort were made, the first sown April 25, and the second May 9. Four rows of 100 feet long, 30 inches apart were sown at each sowing of each variety, and the weight of the yield computed from 66 feet of the two centre rows in each case. The land was prepared as in the turnip test, and was of the same character. The seed did not germinate evenly and the stand was very irregular, making a light yield per acre. The stand was lighter in the early sown plants than in the second series, but the roots were larger and better grown. All were pulled October 22.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot	
						Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Giant Yellow Globe	April 25	May 9	Oct. 22	Oct. 22	30	984	1,016	24	16	473	541	12
2	Yellow Intermediate	" 25	" 9	" 22	" 22	27	912	915	12	9	480	308	..
3	Mammoth Long Red	" 25	" 9	" 22	" 22	27	648	910	48	16	1,264	554	24
4	Triumph Yellow Globe	" 25	" 9	" 22	" 22	24	1,104	818	24	10	1,658	360	58
5	Giant Sugar Mangel	" 25	" 9	" 22	" 22	21	240	704	..	13	1,192	453	12
6	Perfection	" 25	" 9	" 22	" 22	19	148	635	48	13	1,984	466	34
7	Half Long Sugar White	" 25	" 9	" 22	" 22	19	16	633	36	13	1,060	451	..
8	Prize Winner Yellow Globe	" 25	" 9	" 22	" 22	18	1,356	622	36	19	1,204	653	24
9	Selected Yellow Globe	" 25	" 9	" 22	" 22	18	696	611	36	13	4	433	24
10	Mammoth Yellow Intermediate	" 25	" 9	" 22	" 22	17	1,904	598	24	13	928	448	48
11	Lion Yellow Intermediate	" 25	" 9	" 22	" 22	16	826	547	16	13	1,984	466	24
12	Prize Mammoth Long Red	" 25	" 9	" 22	" 22	15	96	501	36	14	248	471	48
13	Gate Post	" 25	" 9	" 22	" 22	14	248	470	48	7	784	246	24
14	Leviathan Long Red	" 25	" 9	" 22	" 22	13	1,984	466	24	12	1,872	431	12
15	Giant Yellow Intermediate	" 25	" 9	" 22	" 22	13	268	437	48	11	1,760	396	..
16	Selected Mammoth Long Red	" 25	" 9	" 22	" 22	12	1,344	422	24	7	1,576	259	36
17	Golden Giant	" 25	" 9	" 22	" 22	12	288	404	48	13	796	446	36
18	Half Long Sugar Rosy	" 25	" 9	" 22	" 22	10	1,272	354	32	8	1,160	286	..

EXPERIMENTS WITH SUGAR BEETS.

Eight varieties of sugar beet seed were sown alongside the mangels. The soil was of the same nature and the preparation was the same. Two sowings of each sort were made, but the seed did not germinate sufficiently in any of the plots to admit of any estimate as to their relative productiveness.

POTATOES.

Forty-six varieties of potatoes were tested this year. The land was sandy loam which had been heavily dressed with barn-yard manure in the spring of 1903 and sown to pease. It was fall-ploughed last fall and harrowed every few days from early in the spring until May 12, when the potatoes were planted. They were planted in drills thirty inches apart and the sets one foot apart in the drill. They were har-

rowed three times before they were well up, which with the harrowing given the ground before planting, left the land pretty clean and cultivation with the horse hoe and two sprayings with Bordeaux mixture, one on July 8, the other three weeks later, was all the treatment given until they were dug. The yields in most cases are very fair and the quality is excellent. There was no rot in any of the varieties. Four rows of one hundred feet each were planted, and the yield calculated from the weight obtained from sixty-six feet of the two centre rows. The seed used was in each case medium sized, smooth potatoes cut in two strong eyes in each set. All were dug September 20 and 21.

POTATOES—TEST OF VARIETIES.

Number.	Name of Variety.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Enormous	572	..	486	12	85	48	Long, white.
2	Uncle Sam	528	..	475	20	52	40	Round, white.
3	Daniel's Sensation	519	12	441	20	77	52	Oval, white.
4	Rose No. 9	492	48	443	..	49	48	Long, rose.
5	Rawdon Rose	479	36	408	..	71	36	"
6	Sabean's Elephant	471	08	376	08	95	..	Long, flat, white.
7	Holborn Abundance	457	36	411	57	45	45	Round, white.
8	Country Gentleman	456	30	366	30	90	..	Long, pink and white.
9	I. X. L	453	12	371	42	81	30	Long, flat, pink.
10	Seedling No. 7	448	48	399	18	49	30	Long, red.
11	Empire State	440	..	352	..	88	..	Long, pink and white.
12	Rochester Rose	435	36	348	..	87	36	Long, rose.
13	Cambridge Russet	435	36	345	..	90	36	Oblong, russet.
14	Prolific Rose	431	12	323	12	108	..	Oblong, rose.
15	Clay Rose	426	48	341	18	85	30	"
16	General Gordon	422	24	336	54	84	30	Oval, pink.
17	Reeves' Rose	422	24	340	48	81	36	Long, rose.
18	Early St. George	419	40	358	04	61	36	Long, white.
19	Pearce	415	16	334	16	81	..	Long, pink and white.
20	Swiss Snowflake	409	12	328	..	81	12	Long, white.
21	Vick's Extra Early	404	48	325	18	79	30	Round, pale rose.
22	State of Maine	402	36	301	36	101	..	Long, pink.
23	American Wonder	396	20	317	..	79	20	Long, flat, white.
24	Late Puritan	393	48	324	..	78	48	Long, white.
25	Early Rose	391	36	274	08	117	28	Oblong, rose.
26	Sutton's Invincible	390	30	292	54	97	36	Long, white.
27	New California	389	..	311	..	78	.	Round, white.
28	Dreer's Standard	378	24	255	54	113	30	Oval, white.
29	Penn Manor	376	12	319	42	56	30	Long, red.
30	Blue Beauty	366	36	275	..	91	36	Oval, blue
31	Everett	361	8	316	..	45	08	Oblong, red.
32	Carman No. 1	356	44	285	20	71	24	Round, white.
33	Sutton's Supreme	334	24	267	24	67	..	Long, white.
34	Delaware	325	36	244	06	81	30	Round, white.
35	Burnaby Seedling	320	52	272	52	48	..	Long, rose.
36	American Giant	312	24	250	..	62	24	Long, white.
37	Canadian Beauty	308	00	246	..	62	..	Long, flat, pink.
38	Bovee	305	48	244	18	61	30	Long, rose.
39	Early Andes	290	24	217	54	72	30	Round, rose.
40	Carman No. 3	288	12	201	42	86	30	Oblong, white.
41	Irish Cobbler	270	36	216	36	54	..	Round, white.
42	Maule's Thoroughbred	237	36	142	36	95	..	Long, rose.
43	Early Envoy	226	36	156	56	69	40	Long, pink and white.
44	Moneymaker	215	36	167	36	48	36	Long, white.
45	Early White Prize	206	48	155	18	51	30	Oblong, white.
46	Pingree	176	..	106	..	70	..	"

Cattle in Pasture, Experimental Farm, Agassiz, B.C. [By Frank T. Shutt.]

CUT VERSUS WHOLE SEED POTATOES.

A test was made as to the relative merit and cost of large and medium small cut seed and medium sized whole sets. The plots were arranged as in the uniform test plots, drills thirty inches apart and in the case of the cut sets one foot apart in the drills, and in the whole sets they were eighteen inches apart in the drill.

Two plantings were made in each case, the first April 12, and the second April 25.

Plots 1 and 2A.—The seed was cut from large potatoes and the sets were fairly large and each had not less than three eyes, and weighed on an average about 1 ounce each.

Plots 1 and 2B.—The seed was cut from smooth even average sized potatoes and the sets were cut to two eyes each, and would average about ¾ oz. each.

Plots 1 and 2C.—The sets were whole, smooth, even-sized potatoes, averaging from 2½ to 3½ oz. each.

All were dug September 21, at which time the tops were ripened and dead.

Name of Variety.	Planted.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Weight of Seed per Acre.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Lbs.
Rose No. 9, plot 1 A; cut seed, large sets ..	April 18..	620	18	474	..	146	18	1,090
" " 2 A " " ..	" 25..	572	..	436	..	136	..	1,040
" " 1 B; cut seed, 2 eyes to sets	" 18..	591	16	510	16	81	..	780
" " 2 B " " ..	" 25..	545	36	451	36	94	..	760
" " 1 C; large, whole sets....	" 18..	786	24	600	..	186	24	2,100
" " 2 C " "	" 25..	673	..	519	..	154	..	2,048

SUMMARY OF CROPS.

	Tons.	Lbs.
Hay	114	1,900
Corn for ensilage and fed green	67	..
Clover in silo	56	..
Turnips	17	600
Mangels	8	1,000
Carrots	2	..
Oats	7	1,000
Pease	3	800
Wheat	1	500
Barley	2	1,000
Potatoes	4	..

FODDER PLANTS.

The following millets and other fodder plants were tested on plots of one-fortieth of an acre each.

The millets were sown April 22, but as only about ten per cent of the seed germinated, the plots were ploughed and sown with rape :—

Plot 1.—Italian Millet.
Plot 2.—Pearl Millet.
Plot 3.—Hungarian Millet.
Plot 4.—Green California.
Plot 5.—White Round.
Plot 6.—Penicillaria.

HORSE BEANS.

Three plots of horse beans were sown April 25.

Plot 7, sown in drills 21 inches apart; seed did not germinate evenly. Growth poor, stalks about 20 inches long, not well podded. Weight when cut 2 tons 840 lbs.

Plot 8, 28 inches apart in the drill; stalks 24 to 30 inches long; not many pods; weight when cut 2 tons 1,620 lbs.

Plot 9, 35 inches apart in the drill; pods 2 to 2½ inches long; not well filled; weight when cut 2 tons 1,080 lbs.

These plots were badly infested with aphis early in August, which doubtless reduced the yield; cut October 10 to October 31.

Soja Beans.—These make a better growth on our warm sandy soil than the horse bean, and as they branch freely, and have a great deal of foliage, as well as many pods, the cattle, horses, pigs and sheep are very fond of them, and on rich land fairly heavy crops can be raised, but clover can be grown so much more cheaply and more feed per acre can be got from clover, that it does not pay except under exceptional conditions to raise Soja beans, especially as the seed seldom ripens sufficiently to be of use.

Three plots were sown April 25 and harvested October 10, at which time a fair percentage of the pods contained seeds in a nearly matured state.

Plot 10, sown at 21 inches apart in the drill; a fair even stand; well podded and very leafy; pods 1 to 1¼ inches long, containing from 1 to 3 seeds each; stalks 24 to 30 inches, and well branched; weight when cut 4 tons 400 lbs.

Plot 11, sown at 28 inches apart in the drill; well podded; very leafy and well branched; pods more matured than where closer together in the drills; weight when cut 4 tons 1,160 lbs.

Plot 12, sown at 35 inches apart in the drills; a fine stand; stalks 30 to 40 inches long; well branched and very leafy; well podded and the pods and seeds more mature than those on the plots where the drills were closer together; weight when cut 4 tons 1,040 lbs. per acre.

CLOVER VERSUS CORN FOR ENSILAGE.

As the weather in June is so often showery, that hay is very difficult to harvest and as clover makes good ensilage, it was thought desirable to compare the crop of an acre of average clover, with an acre of corn. Clover had been seeded in the spring of 1903, and immediately after the wheat crop with which it was grown had been harvested a dressing of about ten tons per acre of barn-yard manure was applied, direct from the stable as fast as it was made, and in spring was harrowed to break up the manure.

The first cutting was made June 20, a bright clear day, and the crop was hauled direct to the barn, weighed and put into the silo. The second crop was cut August 3 and put into the silo. The first cutting weighed 13 tons 273 pounds, second cutting, 12 tons 1,450 pounds, making a yield of 25 tons 1,723 pounds per acre.

One acre of Compton's Early corn, which is one of the best for this locality, planted May 20 and cut October 8, when in roasting ear weighed 19 tons 1,840 pounds, making a difference of nearly six tons per acre in favour of clover. There is a difference in favour of the clover in the cost of production and also in the condition in which the land is left for further cropping.

GARDEN VEGETABLES.

RADISHES.—Sown April 11.

Early Scarlet Turnip. Fit for use, May 8. Crisp, sweet.
Olive-shaped Scarlet. Fit for use, May 12. Crisp.
French Breakfast. Fit for use, May 20. Very good.

LETTUCE.—Sown April 12.

Big Boston. Fit for use, May 18. Crisp, tender.
Nonpareil Cabbage. Fit for use, May 20. Fine heads, sweet and crisp.
Deacon. Fit for use, May 24. Solid, crisp, sweet.
All the Year Round. Fit for use, May 28. Solid, fine quality.

CARROTS.—Sown April 12.

French Horn. Fit for table, June 9. Very sweet and crisp.
Half Long Scarlet Nantes. Fit for table, June 20. Fine flavoured.
Luc Half Long. Fit for table, July 8. Very sweet, crisp.
Long Scarlet Altringham. Fit for table, July 20. Crisp; sweet; good.

TABLE TURNIPS.—Sown April 10.

Early White Milan. Fit for table, June 10. Very sweet and fine.
Early Snowball. Fit for table, June 14. Rapid grower, good quality.
Red Top Strapleaf. Fit for table, June 14. Rapid grower, very mild.
Hazard's Swede. Fit for table, July 28. Very sweet and fine flavoured.

ONIONS.—Sown April 4.

Extra Early Flat Red. Uniform size; mild, firm, sweet, very good.
Large Red Wethersfield. A fine cropper, solid, smooth, mild, good.
Yellow Globe Danvers. Medium size, solid, mild, good.

CABBAGE.—Sown in beds in open ground April 10, and transplanted May 19.

Eureka. Fit for table, July 11. Heads small; solid, crisp, fine flavour. A good header.

Express. Fit for table, July 14. Heads small; medium solid; fine, crisp, sweet.

Extra Early Midsummer Savoy. Fit for table, July 20. Heads soft and open.

New Early Flat Head. Fit for table, July 30. Heads medium size, firm, solid, white, fine flavour.

Charleston Wakefield. Fit for table, July 30. Heads fine size, very solid, white, crisp, good.

Early Winningstadt. Fit for table, August 16. Heads rather open and soft, but quality good.

Green Globe Savoy. Fit for table, September 10. Heads solid, medium size, very sweet, good.

Fielderkraut. Fit for table, September 24. Heads medium size; not solid, but white; crisp, sweet, fine flavour.

Fottler's Drumhead. Fit for table, October. A fine uniform header; solid, crisp, and an excellent winter cabbage.

Quintal Drumhead. Fit for table, October. Heads large, but not firm and solid.

Fottler's Improved Brunswick. Fit for table, October. A regular header. Heads flat, solid, crisp, good, and an excellent keeper.

Danish Ball Head. Fit for table, October. Heads round, solid, medium size; a good keeper and of superior quality.

Marblehead Mammoth. Fit for table, October. Not a sure header; a coarse, strong grower, but not of fine quality for table.

Mammoth Red Rock. Fit for table, October. Heads solid and very dark red, fine, crisp, sweet, very good.

Large German Savoy Drumhead. Fit for table, October. A uniform header; very solid, crisp, sweet, delicate flavour, and a good keeper.

CAULIFLOWERS.—Sown April 12; transplanted May 19.

Extra Early Selected. Fit for table, July 20. Heads extra fine, large, solid, very white, sweet.

Half Early Paris. Fit for table, July 26. Heads small, compact, crisp, and very good.

Early Snowball. Fit for table, July 30. A uniform header; heads large, firm, very fine, crisp, delicate.

BROCOLI.—Sown April 12 and transplanted May 19.

Extra Early White. Fit for table, August 24. A uniform header; heads large, firm, white, flavour delicate, and good.

BRUSSELS SPROUTS.—Sown April 12 and transplanted May 19.

Dwarf Improved. A fine grower, and well furnished with solid, crisp sprouts.

BEETS.—Sown April 28.

Crimson Globe. Fit for table, July 13. A fair size, crisp, sweet, and very dark red.

Egyptian. Fit for table, July 20. An even, rapid grower of very fine flavour.

Early Blood Turnip. Fit for table, July 20. A crisp, sweet, fine flavoured dark red beet.

Long Smooth Blood Red. Fit for table, September. Very fine quality; sweet, crisp and good; a good keeper.

BEANS.—Planted May 1.

Dwarf Golden Skinless. Ripe, July 13. A dwarf grower; very productive; pods 2½ to 4 inches long; crisp; stringless, and of good quality.

Extra Early Edible Podded. Ripe, July 15. A dwarf grower; productive; pods 4 to 5 inches long; quality good.

Royal Dwarf Kidney. Ripe, July 16. A bushy grower; fairly productive; tender and of pleasant flavour.

Crystal White Wax. Ripe, July 19. A bushy grower; fairly productive; pods 4 to 5 inches long; plump, crisp, and of good flavour.

Fame of Vitry. Ripe, July 20. A strong grower; productive; pods 4 to 6 inches long; crisp, tender, of pleasant flavour, good.

Dwarf Emperor of Russia. Ripe, July 20. A bushy, strong grower; very productive; pods 4 to 5 inches long; crisp, and of very fine flavour.

Dwarf Inexhaustible. Ripe, July 22. Very dwarf; bushy; productive; pods 3 to 5 inches long; crisp, of very pleasant flavour, good.

Dwarf Black Speckled. Ripe, July 24. Dwarf; bushy; productive; pods 4 to 6 inches long; fleshy, crisp, juicy, and of very pleasant flavour.

GARDEN PEASE.—Sown April 4.

Sutton's May Queen. Fit for table, June 18. Pods 2 to 3 inches long; well filled; pease of medium size; good quality; productive.

Alaska. Fit for table, June 18. Vines well podded; pods well filled with pease of fine flavour and quality.

American Wonder. Fit for table, June 20. Vines short, and well furnished with long, well filled pods of sweet, fine-flavoured pease.

Nott's Excelsior. Fit for table, June 22. A fine cropper, and fine-flavoured pease.

Premium Gem. Fit for table, June 24. Vines 2 feet long, and productive; pods long, and well filled.

McLean's Advancer. Fit for table, June 30. Vines 24 to 30 inches long; well podded; pease of medium size, and very fine quality.

Gradus. Fit for table, July 2. Vines 30 to 36 inches long, and well furnished with long, well filled pods; pease large, sweet and good.

Heroine. Fit for table, July 4. Vines 20 to 24 inches long; a fine producer; pods long, well filled; pease large, and very superior in quality.

Sutton's Conqueror. Fit for table, July 7. Productive; pods long, well filled with large pease of very fine quality.

Duke of Albany. Fit for table, July 10. Fairly productive; pods long, and well filled with medium large pease of very fine flavour.

Admiral. Fit for table, July 11. Vines long and productive; pease large, tender, and of fine quality.

Rent Payer. Fit for table, July 11. Vines of medium length; pods long, and well filled with large pease of superior flavour.

New Dwarf Telephone. Fit for table, July 15. Vines short, but very productive; pease large, sweet, and of fine flavour.

Stratagem. Fit for table, July 15. Vines short; productive; pods long, and well filled; pease large, very sweet, and of fine quality.

Sutton's Perfection. Fit for table, July 18. Vines 12 to 18 inches long, stout and productive; pease large and fine flavoured.

Sutton's Late Queen. Fit for table, July 20. Vines productive; pods containing 5 to 10 large, sweet peas.

Squash.—Planted May 7.

Crookneck. Ripe, August 10. Poor growth, but productive.

Faxon. Ripe, August 10. Growth uneven; productive; squash flat, 6 to 10 inches in diameter; flesh solid, and of good quality.

Boston Marrow. Ripe, August 15. Growth feeble; productive; squash 10 to 15 inches long, 4 to 7 inches in diameter; flesh yellow, rich and sweet.

Hardshell Marrow. Ripe, August 15. Growth medium; productive; squash from 9 to 15 inches in length, 5 to 7 inches in diameter; flesh orange; thick, good; very fine quality.

Chicago Orange Marrow. Ripe, September 4. Growth vigorous; productive; squash oval, 10 inches by 8; flesh thick, rich, sweet, good.

Fordhook. Ripe, September 8. Growth feeble; productive; squash 6 to 10 inches in length, 7 to 9 inches in thickest part; flesh orange; very fine quality.

Essex Hybrid. Ripe, September 10. Growth medium; not productive.

Delicata. Ripe, September 10. Growth vigorous; very productive; squash 10 to 12 inches long and 4 to 5 inches in diameter; skin thin, yellow, streaked with dark green; flesh light yellow, firm, thick, of very good quality; a good keeper.

English Vegetable Marrow. Ripe, September 10. Growth medium; productive; squash 10 to 12 inches long, 4 to 6 inches in diameter; flesh pale yellow; quality fair.

Michigan. Ripe, September 15. Growth feeble; productive; squash 6 to 12 inches long, 3 to 4 inches in diameter; colour dark green; flesh solid, of very good quality; similar in size, shape and style of growth to Delicata.

Golden Hubbard. Ripe, September 15. Growth feeble; productive; squash of fair size, and of good quality.

Delicious. Ripe, September 20. Growth fair; productive; squash 5 to 8 inches from stem to blossom, and 4 to 8 inches in diameter; skin dark green; flesh orange thick, solid, of very good quality; a winter squash.

Sweet Corn.—Planted April 20.

Prémo. Fit for table, August 2. Ears 4 to 6 inches long; kernels deep, sweet, and of fine flavour.

First of All. Fit for table, August 4. Ears 4 to 6 inches long, well filled to tip; corn sweet and finely flavoured.

Cory Sugar. Fit for table, August 4. Productive; ears well filled with deep, large kernels of sweet, rich, full flavoured corn.

SAMPLES DISTRIBUTED.

A large number of sample packages of grain, potatoes, nuts and other tree seeds and scions were distributed to farmers by mail in response to applications received from them. From the reports received it is evident that this work is productive of much good.

Packages of scions and cuttings	238
3 lb. samples of potatoes	164
3 " oats	153
3 " pease	120
3 " spring wheat	86
3 " barley	74
Nut and tree seeds, bulbs, &c.	599
	1,444

CORRESPONDENCE.

Letters received, 2,942; letters despatched, 2,772.

APPLES.

The spring was not a good one for fruit, as the weather during the blossoming time was showery and cold, and a light frost during this period caused much of the fruit to fall, but owing to fine, bright weather during the late summer and autumn, the fruit developed well and coloured finely, and the quality has been very good, and the crop of most varieties a medium one. No new sorts have been planted this year, but a good many varieties have fruited for the first time. Only those which were sufficiently matured to describe their quality as well as the outside appearance have been described.

The following is a list of the summer and fall apples fruiting for the first time. While many of these will doubtless prove of little value here, yet there are some that on further test, may prove to be of merit in their season.

1. *Earliest of All.*—Tree a spreading, straggling grower, and not productive. Fruit small, oblate, roundish. Stem short. Calyx small, closed. Basin shallow. Skin greenish yellow. Flesh whitish, juicy, firm, sprightly acid, of poor quality. Nothing to recommend it. Ripe last of July.

2. *Thomas Rivers.*—Tree a vigorous grower. Fruit of medium size, conical. Stem medium length, cavity deep, and narrow. Calyx small, closed. Basin narrow and deep. Skin clear, bright yellow. Flesh white, coarse, not very juicy, pleasant, mild; sub-acid or nearly sweet. Season August.

3. *September Beauty.*—Tree a poor grower. Fruit of medium size, conical. Stem short, cavity narrow and deep. Calyx small and closed. Basin shallow and narrow. Skin greenish yellow, with a bright red cheek and many whitish dots. Flesh yellowish, crisp, not very juicy, a sprightly pleasant acid. Season early August.

4. *Lord Sudely.*—Tree a moderate grower. Fruit medium to large, oblate conical. Stem short, cavity narrow and deep. Calyx small, closed. Basin narrow, deep and

furrowed. Skin clear yellow, nearly overspread with bright red, and sprinkled with many gray dots. Flesh yellowish, a little coarse grained, crisp, juicy, mild pleasant sub-acid, slightly vinous, good. Season August.

5. *Domino.*—Tree a strong grower, and an early bearer. Fruit large, conical. Stem of medium length. Cavity narrow and deep. Calyx large, closed. Basin deep, narrow and furrowed. Skin pale whitish yellow, with a bright red blush and a few brown dots. Flesh white, crisp, a little coarse grained, juicy, mild, pleasant flavour, sub-acid. Season August.

6. *White Pineating.*—Tree a slow grower. Fruit small, round, flattened; stalk long and slender; cavity narrow and deep, calyx small, closed; basin narrow and deep; skin yellow, with a faint blush on sunny side. Flesh crisp, not juicy, mild and of pleasant flavour; not valuable; season August.

7. *Yellow Calville.*—Tree a strong grower. Fruit of medium size, globular; stem short and stout. Cavity moderately deep and wide. Calyx small, closed. Basin shallow and narrow. Skin a clear, glossy, yellow with a little pale red on the sunny side. Flesh white, a little coarse, crisp, juicy, of a mild, pleasant flavour, sub-acid. Season August.

8. *Belle du Havre.*—Tree a thrifty grower and an early producer. Fruit above medium size, roundish, conical. Stem long. Cavity wide and deep. Calyx large, closed, Basin wide, deep and corrugated. Skin pale yellow with a bright red cheek and sprinkled with brown dots. Flesh white, crisp, fine-grained, juicy with a pleasant flavour, good. Season August.

9. *Greenup's Pippin.*—Tree a vigorous grower. Fruit of medium size, globular, with uneven sides. Stem medium in length, slender. Cavity deep and narrow. Calyx small, closed, set in a narrow deep basin. Skin clear yellowish green, with a dull red cheek. Flesh white, juicy, sprightly, tender, nearly sweet, with a pleasant flavour. Season August.

10. *Early Rivers.*—Tree a strong grower. Fruit medium to large, conical. Stem long. Cavity shallow and narrow. Calyx small, closed. Basin, small, shallow and corrugated. Skin greenish yellow. Flesh whitish, a little coarse, granular, juicy, a mild, pleasant flavour, acid, a fine cooking apple. Season August.

11. *Tyra Mostbirne.*—Tree a vigorous grower. Fruit of medium size, globular, Stem short. Cavity deep and narrow. Calyx large, closed. Basin wide and deep, corrugated. Skin greenish yellow, with streaks and splashes of deep red on the sunny side. Flesh whitish, crisp, juicy, a little coarse and a little granular, a mild pleasant acid. Season August.

12. *Dutch Codlin.*—Tree a strong grower. Fruit large, roundish, ribbed from stem to calyx. Stem long. Calyx large. Basin shallow. Flesh white, coarse, mildly acid. Moderately juicy. A good cooking apple. Season, August.

13. *Barchard's Seedling.* Tree a vigorous grower and productive. Fruit of medium size, oblate, conical. Stalk short. Cavity small. Calyx small, open. Basin narrow and deep. Skin greenish yellow, with stripes and patches of bright red over nearly the whole surface. Flesh white, fine grained, juicy of a mild, pleasant flavour, sub-acid, good. Season, late August.

14. *C. H. R. Starr.*—Tree a moderate grower. Fruit small roundish, oblate. Stalk long. Cavity narrow and shallow. Calyx small, closed. Basin narrow and shallow. Skin yellow, with a bright red cheek. Flesh whitish, juicy, sub-acid, a little coarse, of a mild pleasant flavour. Season, September.

15. *Lady Derby.*—Tree a strong grower. Fruit medium to small, oblate. Stem short. Cavity deep and wide. Calyx small, closed. Basin wide and deep. Skin clear, bright yellow with stripes and splashes of bright red on the sunny side. Flesh yellowish, fine grained, crisp, juicy, acid, and of a pleasant flavour. Season, September.

16. *Bijou.*—Tree a vigorous grower. Fruit of medium size, roundish oblate. Stem long. Cavity narrow and shallow. Calyx large, closed. Basin wide and shallow. Skin yellow, nearly overspread with dull red. Flesh yellowish, crisp, moderately juicy, mild, pleasantly acid, with a fine rich flavour. Season, September and October.

17. *Sugar Loaf Pippin.*—Tree a slow grower. Fruit below medium size, oblong, conical. Stalk short, often with a fleshy knob at the side. Calyx small, closed. Basin narrow and deep. Skin clear bright yellow. Flesh yellowish, crisp, juicy, mild, sub-acid or nearly sweet, with a pleasant flavour. Season, September.

18. *Grand Sultan.*—Tree a strong, upright, spreading grower. Fruit large, oblong, conical. Stem short. Cavity narrow and deep. Calyx small, closed. Basin deep, moderately wide and deeply corrugated. Skin yellow, nearly covered with dull red. Flesh white, a little coarse, fairly juicy and mildly sub-acid. Season, September.

19. *De Moisson.*—Tree a vigorous grower and an early bearer. Fruit of medium size, conical. Stem short. Cavity narrow and deep. Calyx small, closed. Basin deep and narrow. Skin greenish yellow, with a dull red cheek. Flesh white, crisp, juicy and pleasantly sub-acid. Season, September.

20. *Do Lait.*—Tree a poor grower. Fruit above medium size, oblong, conical. Stem short. Cavity narrow and deep. Calyx large, closed. Basin wide and deep. Skin pale yellow, with a few stripes and patches of bright red. Flesh white, crisp, juicy, sprightly acid, with a pleasant flavour, good. Season, September.

21. *Oswin.*—Tree a strong grower. Fruit medium to large, oblong, oval, stem short, cavity narrow and deep, calyx, large, closed. Basin narrow and deep. Skin greenish yellow, with sometimes a faint blush and a few whitish dots. Flesh whitish, crisp, moderately juicy, briskly sub-acid, with a pleasant flavour. Season, September.

22. *Anis Rise (Niemetz).*—Tree a strong grower and a free producer. Fruit above medium size, globular, somewhat conical. Stem of medium length. Cavity shallow and wide. Calyx small, closed. Basin deep and narrow. Skin pale yellow, with sometimes a few narrow stripes, on sunny side. Flesh white, juicy, crisp, sprightly, tender pleasantly acid, good. Season September.

23. *Bottle Stopper.*—Tree a medium grower. Fruit below medium size, oblong, tapering to eye. Stalk short. Cavity wide and shallow. Calyx large, closed. Basin narrow, shallow and corrugated. Skin green, with many white dots. Flesh white, juicy, sprightly, rather corky. Season September. Quality poor.

24. *Scinde Centre.*—Tree a strong grower. Fruit above middle size, oblong, conical. Stalk short. Cavity deep and narrow. Calyx large, closed. Basin wide and deep. Skin whitish yellow, with streaks and spots of bright red over nearly the whole surface. Flesh coarse, white, crisp, juicy, sprightly, pleasantly acid. Season September.

25. *Kieve Reinette.*—Tree a vigorous grower. Fruit large, oblate, tapering to the eye. Stem short. Cavity narrow and deep. Calyx small, closed. Basin narrow and deep. Skin yellowish white, finely mottled with streaks and patches of red in two shades. Flesh white, a little coarse, moderately juicy, nearly sweet, pleasant. Season September.

26. *White Plikanoff.*—Tree a strong grower. Fruit of medium size, globular, conical. Stem short and slender. Cavity narrow and shallow. Calyx small, closed. Basin deep and narrow. Skin yellowish white, with a few small patches and stripes of bright red). Flesh white, crisp, a little coarse, juicy, mild and pleasantly acid. Season September.

27. *Duchess of Brabant.*—Tree a vigorous grower. Fruit medium to large, oblong, conical. Stalk medium. Cavity deep and narrow. Calyx small, closed. Basin shallow and narrow. Skin greenish white, with stripes of dark red on the sunny side, and sprinkled with gray dots. Flesh white, tender, juicy, crisp, with a pleasant, sprightly flavour; a very good cooking apple. Season, September and October.

28. *Lady Henniker.*—Tree a strong grower and an early producer. Fruit above medium size, roundish, a little conical, ribbed. Stalk short. Cavity wide and deep. Calyx large, open. Basin deep and deeply ribbed. Skin yellow, with a faint red blush, and a few gray dots. Flesh white, tender, moderately coarse, granular, juicy, mild and pleasantly acid. Season October to December.

29. *Lamb Abbey Pearmain.*—Tree a strong grower. Fruit of medium size, oblate, slightly conical. Stalk short. Cavity narrow and deep. Calyx moderately open. Basin shallow and flat. Skin yellow, nearly covered with red in two shades. Flesh white, juicy, crisp, sprightly, sub-acid. A splendid apple for sauce or baking. Season October and November.

30. *Jefferson.*—Tree a medium grower. Fruit small, round, oblate. Stem short. Cavity narrow and deep. Calyx small, closed. Basin wide and deep. Skin clear yellow, with a bright red cheek. Flesh whitish, not juicy, mildly acid, not valuable. Season October.

31. *Harvey's Willshire Defiance.*—Tree a strong grower. Fruit of medium size, oblate tapering to calyx, irregularly ribbed. Stem of medium length. Cavity narrow and deep. Calyx small, closed. Basin shallow and flat. Skin greenish-yellow with a bronze cheek and many russet dots, and a few small patches of russet. Flesh yellowish, firm, crisp, juicy, sweet. Season October and November.

32. *The Vicar.*—Tree a strong grower. Fruit small, roundish oblate. Stem slender, of medium length. Cavity deep and narrow. Calyx large, closed. Basin wide and deep, corrugated. Skin yellow with a bright orange blush. Flesh white, moderately juicy, mild and pleasantly acid. Season September and October.

33. *James Grieve.*—Tree a vigorous grower. Fruit of medium size, roundish, oblate, tapering slightly to the eye. Skin yellowish-white with sometimes a little dull red on sunny side. Flesh white, juicy, tender with a pleasant flavour, nearly sweet. Season October and November.

34. *Prince Lippe.*—Tree a strong grower. Fruit medium to small, oblate, conical. Stalk short. Cavity narrow and deep. Calyx small closed. Basin of medium width and deep. Skin greenish-yellow striped with dull red over nearly the whole surface and sprinkled with small gray dots. Flesh greenish-white, crisp, juicy, fine grained, mild and of pleasant flavour, refreshingly acid, quality good. Season November to January.

35. *Rose.*—Tree a weak grower. Fruit small, flat. Stem slender. Cavity narrow and deep, skin greenish yellow nearly overspread with dull red, with many small whitish dots. Flesh white, not juicy or of fine flavour, nearly sweet. Quality poor. Season, October and November.

36. *Scotch Bridget.*—Tree a vigorous grower. Fruit of medium size, conical, stalk long, cavity wide and deep, calyx small, closed, basin small and corrugated, skin greenish yellow. Flesh white, soft, juicy and pleasantly acid. A good cooking apple. Season, October and November.

37 *Pioneer.*—Tree a feeble grower. Fruit of medium size, globular, a little flattened, stalk short, cavity wide and shallow, calyx small, closed, basin wide and shallow, skin yellow with a few gray dots. Flesh whitish yellow, juicy, tender, crisp with a pleasant aromatic flavour, sub-acid. Season, October and November.

38. *Schoolmaster.*—Tree a very poor grower. Fruit of medium size, roundish oblate. Stalk medium. Cavity narrow and deep. Calyx small, closed. Basin wide and shallow, skin greenish yellow with a red blush on the sunny side, and a few gray dots. Flesh, white, juicy, crisp, sprightly with a pleasant flavour. Season, October and November.

39. *Mrs. Barron.*—Tree a moderate grower. Fruit of medium size, conical. Stalk long. Cavity narrow and deep. Calyx small, closed. Basin shallow and narrow. Skin greenish yellow with a dark red cheek. Flesh white, firm, juicy, crisp and sprightly acid; a good cooking apple. Season, October and November.

40. *Striped Beaufin.*—Tree a vigorous grower. Fruit large, roundish, oblate, heavily ribbed. Stalk short. Cavity narrow and shallow. Calyx large, closed. Basin wide and deep. Skin greenish yellow, with a dull red cheek and many gray dots. Flesh yellowish, firm, juicy, mildly acid. Season, October and November.

41. *Queen Caroline.*—Tree a poor grower. Fruit medium to large, oblate, roundish. Stalk short. Cavity narrow and deep. Calyx small, closed. Basin deep and wide. Skin greenish yellow, with a slight blush and many gray dots. Flesh crisp, juicy, a little coarse, mildly acid. Season, October and November.

42. *Court of Wick.*—Tree a strong grower. Fruit small, conical. Stalk slender. Cavity narrow and deep. Calyx large, open. Basin shallow. Skin greenish orange, with many gray dots and a little reddish blush in the sun. Flesh yellow, crisp, juicy, with a rich aromatic flavour, mildly acid. Quality good. Season, October and November.

43. *G. H. Wright.*—Tree a vigorous grower. Fruit of medium size, oblate. Stalk short. Cavity narrow and deep. Calyx small, closed. Basin of medium width and depth. Skin yellow, with a few russet dots and russet about calyx. Flesh white, tender, granular, not juicy, mildly sub-acid. Season, October and November.

44. *Smith's Seedling.*—Tree a strong grower. Fruit small, oblate. Stalk short. Cavity narrow and shallow. Calyx small. Basin shallow. Skin greenish yellow with a few whitish dots. Flesh white, firm, moderately juicy, a mildly pleasant acid. Season October and November.

45. *Arthur.*—Tree a vigorous grower. Fruit medium to small, oblong, globular. Stalk short. Cavity deep and narrow. Calyx small, closed. Basin narrow. Skin golden yellow, with sometimes a bright red blush. Flesh yellowish, granular, juicy, mildly acid, with a pleasant flavour. Season, November.

46. *Duncan.*—Tree a slow grower. Fruit of medium size, oblate conical. Stalk long. Cavity deep and narrow. Calyx large, open. Basin wide and shallow. Skin greenish yellow with a small dull red blush in the sun. Flesh greenish, white, tender, crisp, juicy, mild and pleasantly sub-acid. Season, November and December.

47. *Seaton House.*—Tree a very moderate grower. Fruit large, flat. Stalk short. Cavity deep and wide. Calyx large, closed. Basin wide and shallow. Skin greenish yellow splashed with clear bright red. Flesh white, crisp, moderately juicy, mildly acid. Season, November.

48. *Gibbin's Russet.*—Tree a strong grower. Fruit small, flat. Stem short. Cavity narrow and deep. Calyx small. Basin deep and narrow. Skin russet yellow. Flesh juicy, fine grained, mildly acid with a pleasant flavour. Season, November and December.

49. *Peter.*—Tree a strong grower. Fruit of medium size, globular, tapering slightly to eye. Stalk long, slender. Cavity narrow and of medium depth. Calyx small, closed. Basin moderately wide and deep. Skin yellow, nearly entirely overspread with dark and light red. Flesh crisp, juicy, a mild pleasant acid. Season, November and December.

50. *Landsburg Reinette.*—Tree a vigorous grower. Fruit medium to large, oblate. Stalk medium. Cavity deep and wide. Calyx small, closed. Basin narrow and deep. Skin orange yellow, with a faint red blush. Flesh yellowish, moderately juicy, tender with a pleasant flavour nearly sweet. Season, November and December.

51. *Walton Abbey Seedling.*—Tree a slow grower. Fruit large, roundish, slightly conical. Stem short. Cavity medium in depth. Calyx small, closed. Basin narrow and deep. Skin yellow, with a dull red blush and a few russet dots and russet about the stalk. Flesh white, fairly juicy, fine grained, tender, mildly sub-acid. Quality good. Season, November and December.

52. *Evagil.*—Tree a strong grower. Fruit of medium size, roundish globular. Stalk long. Cavity wide and deep. Calyx large, closed. Basin wide and deep. Skin

greenish yellow, with many gray dots. Flesh yellowish, crisp, juicy, mild and pleasantly acid. Season, November and December.

53. *Coos River Beauty.*—Tree a strong grower. Fruit large, oblate, conical, somewhat ribbed. Stalk short. Cavity wide and of medium depth. Calyx medium, open. Basin narrow, deep and corrugated. Skin bright yellow. Flesh white, coarse, not very juicy, mild and pleasantly acid. Season, November and December.

54. *Kingston Black.*—Tree a vigorous grower. Fruit of medium size, conical. Stalk short. Cavity narrow and shallow. Calyx small, closed. Basin deep and wide. Skin yellow, nearly overspread with deep red and freely sprinkled with small whitish dots. Flesh white, firm, not juicy, mildly acid. Season, November and December.

55. *Siegfried.*—Tree a vigorous grower. Fruit medium to large, oblate, roundish. Stem short. Cavity narrow, funnel-shaped. Calyx large, closed. Basin wide and deep. Skin yellow with a dull red cheek. Flesh greenish white, tender, juicy, sprightly with a pleasant flavour. Season, November to January.

56. *Forge.*—Tree a strong grower. Fruit of medium size, oblong, oval. Stalk short. Cavity, narrow and deep. Calyx small, closed. Basin deep and corrugated. Skin pale yellow, splashed and mottled with two shades of red. Flesh yellowish white, tender, juicy, pleasantly sub-acid. Season, November and December..

57. *Kronish Rosy.*—Tree a vigorous grower. Fruit small, conical. Stalk medium. Cavity narrow and shallow. Calyx small, closed. Basin narrow and shallow. Skin greenish yellow with a little dull red on sunny side. Flesh yellowish, crisp, juicy, mildly acid, nearly sweet, with a pleasant flavour. Season, November to January.

58. *Hormead's Pearmain.*—Tree a vigorous grower. Fruit of medium size, oblong conical. Stalk short. Cavity deep and narrow. Calyx large. Basin wide and shallow. Skin yellow, with a faint blush on sunny side. Flesh white, tender, crisp, juicy, sub-acid, with a good and pleasant flavour. Season, November.

59. *Bramtot.*—Tree a strong grower. Fruit small, conical. Stem short. Cavity wide and shallow. Calyx large. Basin shallow and flat. Skin yellow, with a bright red cheek. Flesh white, coarse, not juicy, a bitter sweet, suitable for cider. Season, November.

60. *Williams' Russet.*—Tree a strong grower. Fruit medium or below medium in size; oblong, globular, tapering a little to the eye. Stalk short. Cavity wide and deep. Calyx large, closed. Basin wide and deep. Skin russet yellow with a pink red cheek. Flesh whitish, tender, juicy, mildly acid, with a pleasant aromatic flavour. Season, November to January.

61. *Betty Geeson.*—Tree a medium grower. Fruit large, oblate, ribbed, angular. Stalk short. Cavity wide and deep. Calyx large, open. Basin wide and deep and heavily ribbed. Skin yellow with a small red blush. Flesh whitish, crisp, firm, moderately juicy, of a mild, pleasant acid character. A good cooking apple. Season, November and December.

62. *Siegende Reinette.*—Tree a medium grower. Fruit large, roundish, globular. Stalk short. Cavity shallow and wide. Calyx small, closed. Basin of medium width and deep. Skin greenish russet with a dull red cheek and many whitish dots. Flesh whitish, fine, tender, moderately juicy, with a pleasant aromatic flavour, sub-acid. Season, November and December.

63. *Royal Russet.*—Tree a strong grower. Fruit above medium size, oblate conical. Stalk short. Cavity deep and narrow. Calyx large, closed. Basin small. Skin greenish yellow, nearly overspread with a fine russet. Flesh white, crisp, tender, fine grained, with a rich, high flavour, nearly sweet. Season, November to January.

64. *Reinette de Canada.*—Tree a strong grower and an early bearer. Fruit above medium size, conical. Stalk long. Cavity medium deep and wide. Calyx large, closed. Basin wide and moderately deep. Skin greenish yellow, with a red cheek and

a few yellowish dots. Flesh white, fine grained, juicy, of a brisk, pleasant, acid character. Quality good. Season, November and December.

65. *Pigeon Gris.*—Tree a vigorous grower. Fruit of medium size, conical. Stalk short. Cavity narrow and shallow. Calyx small, closed, narrow and shallow. Skin greenish yellow with a fine russet over the surface. Flesh white, fine grained, moderately juicy, with a rich, pleasant flavour; nearly sweet. Season, November to January.

66. *Tom Putt.*—Tree a strong grower. Fruit medium to large, globular, conical. Stem medium, and cavity medium in width and depth. Calyx large, open. Basin deep, narrow and corrugated. Skin pale yellow with a small blush in the sun. Flesh white, a little coarse and rather dry; not of fine quality. Season, November and December.

67. *Colville Blanche d'Hiver.*—Tree a strong grower. Fruit of medium size, roundish, conical. Stem short. Cavity deep and wide. Calyx large, closed. Basin wide, deep and deeply ribbed. Skin yellow with a faint blush in the sun. Flesh yellowish white, fairly juicy, not of high quality. Season, November to January.

68. *Yellow Arkad.*—Tree a strong grower. Fruit medium to large, oblate, conical, heavily ribbed. Stalk short. Cavity narrow and shallow. Calyx large, open. Basin deep and wide and heavily ribbed. Skin yellow with a mottled red blush and many white dots. Flesh whitish, coarse, juicy, pleasantly sub-acid. Season, November and December.

69. *Swinsovka.*—Tree a vigorous grower. Fruit medium to large, conical. Stem short. Cavity narrow and deep. Calyx small. closed. Basin shallow and narrow. Skin greenish yellow, with a bright handsome red cheek, and sprinkled with many white dots. Flesh white, a little coarse, juicy, mildly sub-acid, with a pleasant flavour. A fine cooking apple. Season, November and December.

70. *Aunt Ginnie.*—Tree a strong grower. Fruit of medium size, conical, irregular, ribbed. Stalk short. Cavity deep and narrow. Calyx moderately open. Basin deep and narrow. Skin yellow, nearly covered with stripes and patches of light and dark red, with a little russet about the stalk. Flesh greenish white, tender, crisp, fairly juicy, mildly sub-acid, with a pleasant flavour. Season, November and December.

71. *Ringer.*—Tree a vigorous grower. Fruit above medium size, roundish, flattened. Stalk short. Cavity moderately deep and wide. Calyx small, closed. Basin narrow and shallow. Skin greenish yellow, with sometimes a faint blush, and many gray dots. Flesh yellowish, crisp, firm, juicy, pleasantly acid. A very fine cooking apple. Season, November and winter.

72. *Gospatrick.*—Tree a medium grower. Fruit below medium size, oblong conical. Stalk short. Cavity narrow and deep. Calyx large, closed. Basin narrow and deep. Skin yellow, with a red cheek in the sun. Flesh white, crisp, of fine texture, juicy, mildly sub-acid, with a very pleasant flavour. Season, November and December.

73. *Small's Admirable.*—Tree a vigorous grower. Fruit of medium size, oblate conical. Stalk long, slender. Cavity narrow and shallow. Calyx small, closed. Basin narrow and of medium depth. Skin greenish yellow, with russet about the cavity, and sprinkled with russet dots about the eye. Flesh white, juicy, mild, crisp, fine grained, nearly sweet, and of a delicate flavour. Season, November and December.

74. *Gray French Reinette.*—Tree a strong grower. Fruit small, roundish conical. Stem short. Cavity deep and narrow. Calyx large, closed. Basin wide and corrugated. Skin greenish russet. Flesh whitish, juicy, with a rich pleasant flavour; sub-acid. Season, November and December.

75. *Jacques Lebel.*—Tree a strong grower. Fruit above medium size, roundish oblate. Stalk short. Cavity small. Calyx small, closed. Basin narrow and shallow. Skin rich yellow, with a dull red cheek, and many gray dots. Flesh white, fine grained, tender, of a mild, pleasant acid character. Season, November and December.

76. *Cooper's Seedling.*—Tree a feeble grower. Fruit small, roundish globular. Stalk long. Cavity wide and shallow. Calyx large, closed. Basin wide and shallow. Skin greenish yellow, with a purple red cheek and a few gray dots. Flesh white, crisp, moderately juicy, mildly sub-acid, with a pleasant flavour. Season, November and December.

77. *Ornament de Table.*—Tree a poor grower. Fruit below medium size, oblate. Stalk short. Cavity narrow and deep. Calyx large, partly open. Basin wide and flat. Skin yellow, with sometimes a red cheek. Flesh yellowish, juicy, tender, mildly sub-acid, with a pleasant flavour. Season, December.

78. *Lord Hindlip.*—Tree a vigorous grower. Fruit small, globular. Stalk medium. Cavity wide and shallow. Calyx small, closed. Basin wide and deep. Skin pale yellow, nearly covered with russet and sprinkled with gray dots. Flesh yellowish, tender, juicy, nearly sweet, with a fine aromatic flavour. Season, November to January.

79. *Muscat Reinette.*—Tree a poor grower. Fruit small, roundish conical. Stalk short. Cavity narrow and shallow. Calyx small, closed. Basin small. Skin yellow, striped with red. Flesh yellowish, fine-grained, juicy, rich and aromatic, mildly sub-acid. Season, November and December.

80. *Calville Grand Duke Frederic de Bade.*—Tree a strong grower. Fruit large, roundish globular, somewhat ribbed. Stalk short. Cavity narrow and deep. Calyx large, closed. Basin wide and deep. Skin greenish yellow, with stripes of pale red on sunny side. Flesh yellowish, coarse, tender, of pleasant flavour; of a mild, sprightly, acid character. Season, November, December and January.

81. *Reinette de Dippedalle.*—Tree a medium grower. Fruit of medium size, oblong, globular, slightly tapering to the eye. Stalk short. Cavity deep and narrow. Calyx large, open. Basin wide, deep and deeply ribbed. Skin golden yellow, with a small blush in the sun and many gray dots. Flesh white, firm, not very juicy, slightly aromatic, nearly sweet. Season, November and December.

82. *Carter.*—Tree a moderate grower. Fruit small, roundish, oblate. Stalk short. Cavity wide and shallow. Calyx large, closed. Basin wide and flat. Skin yellow, with a few small stripes of dull red. Flesh tender, juicy, sub-acid, with a pleasant flavour. Season, November to January.

83. *Nonsuch.*—Tree a strong, spreading grower. Fruit medium to large, roundish. Stem short. Cavity deep and narrow. Calyx large, open. Basin wide and deep. Skin greenish yellow with a dull red cheek. Flesh white, soft, moderately juicy and pleasantly acid. Season, November and December.

84. *Fiessers Erstling.*—Tree a moderate grower. Fruit of medium size, conical, Stalk short. Cavity deep and narrow. Calyx large, closed. Basin narrow, deep and corrugated. Skin yellow with a deep red cheek. Flesh white, juicy, vinous, sub-acid. Season, November and December.

85. *Reinette de Middlebourg.*—Tree a strong, upright grower. Fruit of medium size, oblong, tapering a little to the eye. Stalk short. Cavity narrow and deep. Calyx small, closed. Basin wide and shallow. Skin greenish yellow, with many gray dots, and a small blush on sunny side. Flesh white, fine-grained, tender, crisp, juicy, of a mild, pleasant acid character. Season, December to January.

86. *Hoover.*—Tree a moderate grower. Fruit of medium size, roundish. Stalk long, cavity deep. Calyx large, open. Basin furrowed. Skin yellow, striped with light and dark red, with a little russet about stem. Flesh yellowish, firm, fine-grained, juicy, sub-acid, with a fine flavour. Season, November and December.

87. *Green Crimean.*—Tree a vigorous, spreading grower. Fruit above medium size, conical. Stalk short. Cavity wide and shallow. Calyx large, open. Basin narrow and shallow. Skin yellow, mottled with stripes and patches of dull red, with russet about the stalk. Flesh yellowish, a little coarse, juicy, sprightly and mildly acid. A good cooking apple. Season, November and December.

88. *Scarlet Nonpareil.*—Tree a slow grower. Fruit small, oblate, flattened. Stalk medium. Cavity deep and wide. Calyx large, closed. Basin wide, shallow. Skin yellow, with a red cheek, and a few whitish dots. Flesh yellowish white, firm, juicy, mildly sub-acid. Season, November and December.

89. *Egremont Russet.*—Tree a vigorous grower. Fruit of medium size, roundish oblate. Stem short. Cavity narrow and shallow. Calyx large, closed. Basin narrow and shallow. Skin clear golden yellow, with a little russet in basin. Flesh white, firm, juicy, fine grained, rich, sugary, with a pleasant vinous flavour. Season, December.

90. *Rymer.*—Tree a moderate grower. Fruit of medium size, roundish oblate. Stalk short. Cavity small. Calyx large, closed. Basin wide and shallow. Skin glossy yellow, with a bright blush. Flesh yellowish, juicy, firm, crisp, sub-acid, with a pleasant flavour. Season, December.

Many of the apples above described as in season during November and December, while fit for the table at that time, are evidently good keepers, and some will no doubt prove valuable as late varieties on further test.

Many of the trees planted in the older orchards having fruited for a number of years, and their relative value pretty well tested, have been removed. In some cases the varieties were poor in quality, in others the trees were unthrifty or unproductive, but as the main object in planting trees on the Experimental Farm is to test their suitability and value for our climate and conditions, a few years' trial after a tree begins fruiting determines its quality and relative usefulness, when, if it is found inferior or lacking in any of the qualities which characterize a first-class fruit, it is removed to make way for other more desirable or untried sorts. A partial list of those which have been removed is appended.

American Pippin.
American Summer Pearmain.
Anis.
Anisovka.
Antonovka.
Aport Grell.
Aport (252).
Aport (23).
Arabka (257).
Arabka.
Arabka Winter.
Arabskoe.
Arkad Solovieff.
Arkansas Beauty.
Autumn Strawberry.
Avenarius.
Bailey Sweet.
Baraboo.
Basil the Great.
Baxter.
Ben Davis.
Bismarck.
Bombshell.
Bottle Greening.
Bradfords Best.
Cabashea.
Canada Baldwin.
Carolina Red June.
Carthouse.
Chenango Strawberry.
Colvert.
Danvers Winter Sweet.
Dickinson.
Dutch Mignonne.
Dwyer.
Early Harvest.
Early May.
Early Ripe.
Excelsior.
Fairmount.
Fallawater.
Fall Jenetting.
Fall Orange.
Fall Wine.
Fameuse.
Fraser River Beauty.
Gideon.
Gideons (No. 20).
Gipsy Girl.
Gracie.
Grandmother.
Green Stripe.
Green Harvest.
Haas.
Hastings.
Hawley.
Hominy
Isham Sweet.
Jacob Sweet.
Kantil Sinap.
Kara Sinap.
Keswick Codlin.
Lanes Sweet.
Large Anis.
Long Arcade.
Lowell.
Magog Red Streak.
Manks Codlin.
Margil.
Mayne Island.
McMahon White.
Melonen.

Milden.
Naliv Ansjutin.
Newton.
No. 181 Budd.
Onondaigua.
Orel No. 1.
Orel No. 5.
Orel No. 6.
Ostrakoff (472) Beadle.
Paperovka.
Parson Sweet.
Persian Bogdanoff.
Pewaukee.
Plodovitka Koslov.
Plums Cider.
Pointed Pipka.
Queen Olga.
Red Astrachan.
Red Bietigheimer.
Red Juneating.
Red Queen.
Red Streak.
Rolfe.
Romenskoe.
Rosy Repka.
Rosy Voronesh.
Royal Table.
Russian Preserve.
Russet Henrys.
Russet Pewaukee.
Russian Tyrol.
St. Lawrence.
Scott's Winter.
Shannon.
Silken Leaf.
Simbirsk No. 4.
Simbirsk No. 5.
Skirsch.
Smokehouse.
Somnitelnoe.
Striped Anis.
Summer Queen.
Summer Red Streak.
Sweet Bough.
Taffets Winter.
Talman Sweet.
Tetofsky.
Titovko Solovieff.
Trenton.
Twenty Ounce.
Ukraine.
Utter's Large Red.
Volga Anis.
Walbridge.
Warner's King.
Washington.
Waxen.
Waxy, Juicy.
Wellington.
Western Beauty.
White Cardinal.
Winter St. Lawrence.
Yellow Ingestre.
York Imperial.

PEARS.

The trees are vigorous and healthy, but they have borne very little fruit at Agassiz. They were full of bloom in spring and looked very promising for a crop, but the April frost caught them just when the fruit was setting, and very few varieties bore any fruit. The following sorts, which have been reported on in previous reports, gave a small crop again this year; Beurre Bosc, Bartlett, Emile d'Heyst, La France, Dr. Jules Guyot and the Keiffer. These were the only old trees which bore fruit. The following sorts fruited for the first time this year :—

1. *Elliott's Early.*—Tree a strong grower. Fruit below medium size, obtuse, pyriform. Stalk ¾-inch long. Cavity shallow. Calyx small, open. Basin shallow. Skin yellow, with a clear red cheek and many gray dots and a little russet about stalk. Flesh, juicy, sweet, tender, somewhat granular; not high flavoured. Season, last of July.

2. *Saint Michael Archangel.*—Tree a medium grower. Fruit above medium size, oblong, pyriform. Stalk stout. Cavity small. Calyx medium, open. Basin shallow and corrugated. Skin pale yellow, splashed with russet and sprinkled with greenish dots. Flesh white, juicy, sweet, tender, aromatic. Season, October and November.

3. *Beurre Spae.*—Tree a strong grower. Fruit large, roundish, pyriform. Stalk of medium length and fleshy at junction. Calyx small and open. Skin yellow, with a little russet, and sprinkled with gray dots. Flesh yellowish, melting, very juicy, sweet, perfumed. Season, October and November.

4. *Daimyo.*—Tree a strong grower. Fruit small, ovate, pyriform. Stalk long, slender and fleshy at junction. Calyx small, open. Basin narrow, deep. Skin yellowish green, with a little russet, and a few russet dots. Flesh coarse, juicy, firm. A cooking pear. Season, November.

5. *Gut-Land.*—Tree a strong grower. Fruit small, acute pyriform. Stem one inch long, no cavity. Calyx large, open. Basin narrow and shallow. Skin greenish russet with a dull red cheek and many gray dots. Flesh white, juicy, buttery, sweet. Season, September.

6. *Thomson.*—Tree a slow grower. Fruit small, long, acute pyriform. Stalk one inch long, curved. Calyx small, open. Basin shallow and narrow. Skin russet with a brown reddish cheek. Flesh yellowish, juicy, melting, sweet. Season, September and October.

7. *Morum Flesh.*—Tree a poor grower. Fruit large, oblong, pyriform. Stalk $\frac{1}{2}$-inch long, set inclined and with a fleshy knob. Calyx large, open, no basin. Skin yellow. Flesh white, sweet, pleasant, moderately juicy. Season, October.

8. *Jewels of Illinois.*—Tree a moderate grower. Fruit above medium size, oblong, pyriform. Stalk long. Calyx open. Skin yellowish green. Flesh yellowish, juicy, almost sweet. Season, October.

9. *Prince Imperial.*—Tree a moderate grower. Fruit of medium size, obtuse pyriform. Stalk short, stout. Calyx small, open. Basin wide and deep. Skin clear yellow with small patches of russet and many gray dots. Flesh yellowish, juicy, buttery, sweet, very good. Season, October.

PLUMS.

The plums, like the pears, suffered from the cold rains in April and from the frost. Very few of the older trees bore fruit this year. Many of the trees of the orchard planted in the spring of 1890 have been removed. Some of them were unproductive, some very subject to rot, and others too small or poor in quality.

The following varieties are new to this country, and have fruited for the first time:—

1. *Damas de Sep.*—Tree a strong grower. Fruit below medium size, globular, with a shallow suture, terminating in a slight depression. Skin dark purple, with a heavy whitish blue bloom. Flesh greenish, juicy, sweet, tender. Stone very small and free. Very fine for canning. Season, last of July.

2. *St. Etienne.*—Tree a strong grower. Fruit below medium size, globular. Stalk $\frac{3}{4}$-inch long. Suture well defined, ending in a small basin, one side enlarged. Skin bright orange, with a whitish bloom and a crimson blush. Flesh yellow, firm, juicy, sweet, with a fine flavour. Stone small, free. Season, last of July.

3. *Reine Claude d'Althan.*—Tree a strong grower. Fruit very small, round. Stem, $\frac{1}{4}$-inch long, set in a small depression. Skin bright clear red, with a whitish bloom. Flesh yellowish, fine grained, not juicy. Stone small, cling. Not valuable. Season, early August.

4. *Climat.*—Tree a strong grower. Fruit large, obtuse, heart-shaped. Stalk short. Cavity small. Calyx well marked. Skin deep red, sprinkled with small golden dots. Flesh yellowish, sweet, juicy, fine grained, with a pleasant flavour. Season, first of August.

5. *Yellow Impératrice.*—Tree a strong grower. Fruit above medium size, roundish oval, with a distinct suture. Skin clear golden yellow, with a little red in streaks about stalks. Flesh yellowish, juicy, sweet, tender, with a very fine flavour. Cling stone. Season, early August.

6. *Reine Claude Dorion.*—Tree a strong grower. Fruit small to medium, roundish oval. Stalk short. Suture well marked. Skin dull greenish yellow, with a few reddish dots, and spots on sunny side. Flesh yellowish, fine grained, juicy, sweet, with a fine rich flavour. Stone small, cling. Season, August.

7. *Prince of Wales.*—Tree a strong upright grower. Fruit large medium, oval shape. Stalk $\frac{3}{4}$-inch long, and set in a slight depression, with a well defined suture.

Skin bright reddish purple, with many yellow dots. Flesh yellowish, juicy, firm, sprightly. Cling stone. Season, August.

8. *Mirabelle Grosse.*—Tree a strong grower. Fruit below medium size. Round, smooth, yellow, with a few crimson dots. Flesh yellow, juicy, sugary, with a very fine flavour. Stone small, free. Season, August.

9. *Early Red.*—Tree a slow grower. Fruit below medium to small, oval. Stalk short set in a small cavity, and a well defined suture ending in a slight depression. Skin dull red with a thin whitish bloom, and sprinkled with golden dots. Flesh yellowish, juicy, a little coarse, with a pleasant flavour. Season, September.

10. *Autumn Compote.*—Tree a vigorous grower. Fruit medium to large oblong oval, with one side enlarged. Stalk long, and set in a small cavity. Skin pale dull yellow, with a thin whitish bloom. Flesh yellowish, a little coarse, juicy, sprightly, with a pleasant flavour. Season, September.

11. *Giant.*—Tree a strong grower. Fruit of medium size, oblong, with a neck. Stalk short. Suture distinct, and one side enlarged. Skin red, with a whitish bloom. Flesh yellowish, juicy, fine-grained, tender, sweet. Stone small, nearly free. Season September.

12. *White Bullace.*—Tree a strong grower. Fruit small, round. Stem short. Skin yellowish white, mottled with red in the sun. Flesh firm, juicy and sweet. A cling stone. Season last of September.

13. *Cheshire Damson.*—Tree a vigorous grower. Fruit small, round. Stalk short. Skin dark purple, covered with a thick bluish bloom. Flesh greenish, firm, juicy, sprightly and pleasant. Season last of September.

CHERRIES.

The cherry trees were full of bloom early in April and some of the sweet cherries set a fair crop, but the continued showery weather in May and June prevented effective spraying, and the rot was severe, and the showers and sunshine during the time of ripening caused much of the sound fruit to split. So severe was this cause of loss that on two trees which were fairly well loaded with ripening fruit, not more than five per cent were sound, this by count of the fruit on several well loaded branches.

The following sorts fruited for the first time this year:—

1. *Kentish.*—Tree a slow grower. Fruit large, flattened at top and bottom. Stalk short. Skin clear deep shiny red. Flesh yellowish white, juicy, sub-acid, and when allowed to hang on the tree until very ripe has a rich pleasant flavour mildly acid. Season last of June.

2. *Grosse Griotte du Vin.*—Tree a healthy grower. Fruit of medium size, roundish, much flattened. Stalk long. Skin very dark glossy red. Flesh and juice dark red, juicy, mild, sprightly acid, with a pleasant flavour. Season July.

3. *Bohemian Black Bigarreau.*—Tree a strong grower. Fruit large, roundish, heart shaped. Stalk short and stout. Skin glossy black. Flesh black, with dark red juice; firm, juicy, rich, sweet, with a very fine flavour. Season July.

4. *Wragg.*—Tree a strong grower. Fruit of medium size, oval. Stalk long, set in a narrow cavity. Skin dark glossy red. Flesh red, with dark red juice; rich, with a pleasant flavour, mildly acid. Stone small. Season July.

5. *Cluster Black Heart.*—Tree a strong grower. Fruit medium to small, heart-shaped. Stalk long. Skin glossy black. Flesh and juice very dark red. Flesh tender, juicy, mild and pleasantly acid. Season July.

6. *Early Juicy.*—Tree a strong grower, but late and unproductive. Fruit of medium size, roundish. Stalk long, slender and set in a slight depression. Skin clear glossy red. Flesh yellowish, tender, juicy, nearly sweet. Season July.

7. *Griotte Acher.*—Tree a medium grower. Fruit of medium size, heart-shaped. Stalk long, set in a narrow basin. Skin dark glossy red. Flesh and juice red. Flesh tender, juicy, nearly sweet, with a pleasant flavour. Season late July.

8. *Guigne Choque.*—Tree a medium grower. Fruit above medium size, oblong oval. Skin yellowish-red. Flesh juicy, sweet with a pleasant flavour. Stone large. Season July.

9. *Bigarreau Mongin.*—Tree a medium grower. Fruit of medium size, heart-shaped. Skin clear glossy yellow with a bright red cheek. Stalk long, set in a deep basin. Flesh yellowish-white, tender, juicy, sweet with a pleasant flavour. Season July.

10. *Chatenay.*—Tree a weak and slow grower. Fruit small, heart-shaped. Stalk very long set in a narrow basin. Skin yellowish-red with dark red dots. Flesh whitish, juicy, sprightly, not valuable. Season early August.

PEACHES AND APRICOTS.

There are only a few trees of these fruits left on the Experimental Farm and these bore no fruit. The peach trees now growing here are perhaps too young to bear much, and the apricots bloom too early and have never borne much fruit.

QUINCES.

The only one of these fruits to bear is the Portuguese, which fruited again this year. Three other varieties blossomed but did not bear fruit.

MEDLARS.

All of the medlar trees fruited this year. There is practically no difference in productiveness or quality of the fruit of the different named sorts, and all make a fine rich jelly.

MULBERRIES.

As in former years the mulberry trees were loaded with fruit.

MOUNTAIN ORCHARDS.

The mountain orchards have made a strong healthy growth and have borne some fruit, plums, apples, pears and medlars, but, as in former years, birds and wild animals eat or destroy much of the fruit.

NUT ORCHARDS.

The Japanese walnut as usual bore a heavy crop of nuts, the Japanese and Spanish chestnuts a fair crop, and the English walnut and the American black walnut a few nuts per tree. A great many applications for nuts to plant are being received and many reports of success with nuts from samples of nuts distributed in previous years are received.

SMALL FRUITS.

The crop of small fruits has been fairly good this year, and a few days earlier than last year. The fruit was not quite so large as usual, which was caused by the dry weather. We have now under test seventy-three varieties of Red and Yellow raspberries. These have all been described in previous reports.

After several years' trial under similar conditions, the following varieties have proved to be the best.

In quality, Sarah is superior to all the others and equal to any in productiveness, but it is not so firm, or so large as the Cuthbert.

RED AND YELLOW RASPBERRIES.

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Phœnix	June 26.	Vigorous	Large	Firm, good quality	Productive.
Pauline	July 1.	"	"	" " continued long in bearing.	"
New Fastolf	" 2.	"	"	Firm, good quality	"
Northumberland Fill Basket.	" 2.	"	Very large	" " continued long in bearing.	"
Duke of Brabant	" 3.	"	Large	Firm, good quality	"
All Summer	" 4.	"	Large medium	" " continued long in bearing.	"
Sarah	" 5.	"	"	Very good quality	"
Lord Beaconsfield	" 7.	"	"	Firm, good quality	"
London	" 7.	"	"	" "	"
Cuthbert	" 8.	"	Large	" "	"
R. B. Whyte	" 8.	"	Large medium	" "	"
French Vice-President	" 8.	"	Very large	" "	"
Golden Queen	" 4.	"	Large	" "	"
Large Yellow	" 6.	"	"	" "	"

BLACK CAP RASPBERRIES.

Nineteen varieties of Black Cap Raspberries are under test. Black Caps require very rich ground. They also require moisture as well as sunshine when the berries are growing and ripening, to ensure a good crop.

The following are the best of those tested here:—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Nemaha	July 8.	Vigorous	Large	Good quality	Productive.
Palmer	" 8.	"	Large medium	"	"
Older	" 10.	"	"	"	"
Kansas	" 10.	"	"	"	"
Mammoth Cluster	" 10.	"	Large	"	"
Gregg	" 12.	"	"	"	"
Progress	" 12.	"	Medium	"	"
Ida	" 12.	"	"	"	"

BLACKBERRIES.

The blackberries gave a fairly good crop this year, there are twenty-nine varieties under test; the following are the best:—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Early King	July 16.	Vigorous	Large	Good quality	Productive.
Snyder	" 22.	"	Large medium	"	"
Hansel	" 22.	"	Medium	"	"
Stone's Hardy	" 22.	"	Large	Very good quality	"
Eldorado	" 22.	"	"	The very best quality	"
Erie	" 24.	"	"	Good quality	"
Agawam	" 25.	"	Large medium	"	"
Taylor	" 25	"	"	"	"
Taylor's Prolific	Aug. 1.	"	"	"	"
Minnewaska	" 2.	"	"	"	"

RED AND WHITE CURRANTS.

Of the forty-two varieties under test, the following are the best:—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
La Fertile	July 3.	Vigorous	Large medium	Good quality	Productive.
Pomona	" 3.	"	"	"	"
Raby Castle	" 3.	"	"	"	"
London	" 3.	"	"	"	"
Red Cherry	" 3.	"	Large	"	"
La Conde	" 4.	"	"	"	"
Prince Albert	" 4.	"	Large medium	"	"
White Cherry	" 7.	"	Large	"	"
LargeWhiteBrandenburg	" 7.	"	"	"	"
White Pearl	" 8.	"	Medium	"	"
Victoria	" 8.	"	Large medium	"	"

BLACK CURRANTS.

Fifty-one varieties of black currants are under test, of these the following are the best:—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Dominion	July 10.	Vigorous	Large medium	Good quality	Productive.
Middlesex	" 10.	"	"	"	"
Merveille de la Gironde	" 10.	"	"	"	"
Boskoop Giant	" 10.	"	Very large	Very good quality	"
Baldwin	" 10.	"	Large medium	Good quality	"
Prince of Wales	" 10.	"	Large	"	"
London	" 12.	"	Large medium	"	"
Black Naples	" 12.	"	Large	"	"
Lee's Prolific	" 12.	"	Large medium	"	"
Pearce	" 12.	"	"	"	"
Pomona	" 12.	"	Large	"	"
Victoria	" 12.	"	Large medium	"	"
Climax	" 12.	"	"	"	"

GRAPES.

The weather during summer and autumn being dry and warm, the following varieties of grapes ripened, in the order named:—

Jessica.
Delaware.
Saunders' Seedling No. 2.
Saunders' Seedling No. 4.
Moore's Early.
Moyer.
Wyoming Red.
Poughkeepsie Red.
Worden.
Emerald.
Martha.
Brighton.
Wilder.
Pocklington.
Brilliant.
Canada.
Lady.
Champion.
Clinton.
Niagara.

METEOROLOGICAL RECORD.

Date of Highest Temperature.	Temperature.	Date of Lowest Temperature.	Temperature.	Rainfall.	Snowfall.	Sunshine.	
	°		°	Inches.	Inches.	Hours.	Minutes.
1903.							
December 3.........	52	December 11 & 27	31	3·31	11	35	18
1904.							
January 3	46	January 18 and 19	15	6·30	4	30	24
February 24........	48	February 8 and 9.	17	2·86	32	23	..
March 25..	63	March 21 and 22..	30	5·32	3	73	36
April 14............	80	April 29	30	3·46	....	139	24
May 22..............	82	May 1 and 31	35	2·34	....	176	30
June 20.	88	June 9...........	37	3·42	....	181	30
July 22.............	93	July 28..........	43	3·45	....	225	36
August 4..........	90	August 23........	41	2·30	....	176	12
September 16.......	81	September 29.....	36	2·37	....	172	36
October 17.........	78	October 25.......	36	3·20	....	68	18
November 3........	67	Nov. 1, 2, 6 & 28..	35	6·43	....	31	30
		Totals..... ...	....	44·76	50	1,333	54

I have the honour to be, sir,

Your obedient servant,

THOS. A. SHARPE.

STATEMENT OF EXPENDITURE ON THE DOMINION EXPERIMENTAL FARMS, FOR THE YEAR ENDING JUNE 30, 1904.

CENTRAL EXPERIMENTAL FARM.

Live stock			$ 306 11
Feed for stock		$ 680 55	
Supplies from experimental plots		547 11	
Grain screenings from grain distribution		116 12	
		$ 1,343 78	
LESS—Supplies to poultry department		253 80	
			1,089 98
Veterinary services and drugs			205 14
Seeds, grain, trees, &c.		$ 1,655 72	
LESS—Value of seeds for grain distribution	$ 281 52		
" trees " tree "	93 37		
" " Arboretum	106 15		
		481 04	
			1,174 68
Implements, tools, hardware and supplies			1,049 56
Drainage and drain tiles			151 55
Manure and fertilizers for experimental plots and horticultural department			448 17
Travelling expenses			1,738 81
Exhibition expenses			655 95
Blacksmithing, harness supplies and repairs			736 57
Bee department			153 27
Wages: farm work, including salaries of officers in charge			4,708 79
Wages: care of stock, including salary of herdsman			3,377 40
Horticultural division, including salaries of officers in charge, also forestry $41.59			4,971 25
Poultry division, also salaries of officers in charge		$ 2,775 25	
Value of grain, &c., supplied by farm		253 80	
			3,029 05
Experimental division, including salaries of officers in charge		$ 3,872 78	
LESS—Value of material supplied for feed		547 11	
" potatoes supplied for seed distribution		151 00	
		698 11	
			3,174 67
Care of hedges, avenues, ornamental trees and grounds			1,316 06
Office assistance, including English and French correspondence and messenger service			4,505 11
Printing of office supplies and stationery			1,302 77
Arboretum		$ 1,193 79	
Value of trees from Seeds, grain, trees, &c		106 15	
			1,299 94
Distribution of trees and tree seeds		$ 177 51	
Value of trees from Seeds, grain, trees, &c.		93 37	
			270 88
Seed testing and care of green-houses			1,157 97
Dairy branch, including salary of dairyman			849 64
Contingencies			134 83
Telegrams and telephones			244 22
Steers, purchased for feeding experiments			1,792 06
Museum			56 83
Books and newspapers			193 33
			$ 40,094 59
LESS—Proceeds of sale of steers, purchased for feeding experiments			2,875 26
			$ 37,219 33

EXPERIMENTAL FARM, NAPPAN, N.S.—EXPENDITURE, 1903-4.

Live stock		$ 209 12
Feed for stock		2,422 03
Veterinary services and drugs		65 72
Seed grain, seeds, trees, &c.		444 11
Implements, tools, hardware and supplies		387 98
Manure and fertilizers		411 86
Travelling expenses		316 83
Exhibition expenses		279 21
Blacksmithing, harness supplies and repairs		417 03
Salary of Superintendent		1,500 00
Wages, farm work, including experimental work with farm crops		2,628 47
Wages, care of stock		1,733 75
Poultry branch		99 20
Horticultural division, including experimental work with vegetables, fruits, forest and ornamental trees and flowers; also care of grounds and salary of officer in charge		1,601 13
Distribution of seed grain, potatoes, &c		173 19
Contingencies, including postage, $149; mail delivery, $97.50		333 85
Printing and stationery		56 11
Books and newspapers		23 92
Telegrams and telephones		54 47
Steers purchased for feeding experiments		927 50
		$ 14,085 48
LESS—Proceeds of sale of steers purchased for feeding experiments		2,000 16
		$ 12,085 32

EXPERIMENTAL FARM, BRANDON, MAN.—EXPENDITURE, 1903-4.

Live stock		$ 26 00
Feed for stock		18 50
Veterinary services and drugs		94 10
Seed grain, trees, seeds, &c		40 95
Implements, tools, hardware and supplies		1,268 67
Travelling expenses		110 49
Exhibition expenses		235 45
Blacksmithing, harness supplies and repairs		507 10
Bee department		71 18
Salary of Superintendent		1,500 00
Wages, farm work, including experimental work, with farm crops, &c		3,334 28
Wages, care of stock		1,013 75
Horticultural branch, including experiments with vegetables, fruits and flowers; also care of Arboretum and grounds		710 90
Forestry branch, including care of hedges		644 25
Poultry branch		95 65
Office help, including delivery of mail, $148		813 20
Distribution of seed grain, potatoes, &c		640 66
Distribution of trees and tree seeds		226 97
Contingencies, including postage, $263.15; renewal of bridge across small lake on farm, $350.93; sinking well, $51		683 56
Printing and stationery		165 14
Books and newspapers		19 25
Telegrams and telephones		87 67
Drainage and drain tiles		40 50
Manure and fertilizers		115 00
Steers purchased for feeding experiments		398 30
		$ 12,861 52
LESS—Proceeds of sale of steers purchased for feeding experiments	$ 580 42	
Value of grain supplied for seed distribution at Ottawa	362 02	
		942 44
		$ 11,919 08

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.—EXPENDITURE, 1903-4.

Live stock		$ 242 00
Feed for stock		58 55
Veterinary services and drugs.		103 95
Seed grain, seeds, trees, &c.		90 46
Implements, tools, hardware and supplies		1,398 17
Travelling expenses		112 66
Exhibition expenses		105 75
Blacksmithing, harness supplies and repairs		199 80
Salary of Superintendent		1,500 00
Wages, farm work, including experimental work with farm crops		3,724 70
Wages, care of stock		775 02
Horticultural branch		420 65
Poultry branch		115 54
Forestry branch, including hedges		287 65
Office help, including delivery of mail		750 00
Distribution of seed grain, potatoes, &c		271 08
Distribution of trees and tree seed		120 78
Contingencies, including postage, $669.39		715 04
Printing and stationery		65 91
Telegrams and telephones		42 15
Manure and fertilizers		14 27
Books and newspapers		3 50
Steers purchased for feeding experiments		470 00
		$ 11,587 63
LESS—Proceeds of sale of steers purchased for feeding experiments	$ 785 00	
Value of grain supplied for grain distribution at Ottawa	1,127 35	
		1,912 35
		$ 9,675 28

EXPERIMENTAL FARM, AGASSIZ, B.C.—EXPENDITURE, 1903-4.

Live stock	67 13
Feed for stock	47 58
Veterinary services and drugs	4 40
Seed grain, seeds, trees, &c.	99 03
Implements, tools, hardware and supplies	177 99
Manure and fertilizers	137 37
Travelling expenses	181 94
Exhibition expenses	254 54
Blacksmithing, harness supplies and repairs	151 75
Salary of Superintendent	1,500 00
Wages, farm work, including experimental work with farm crops, vegetables, fruit trees, vines, &c	3,018 57
Wages, care of stock	549 00
Poultry branch	65 95
Forestry branch, including care of hedges	216 00
Office help	130 00
Distribution of seed grain, potatoes, &c.	112 80
Distribution of trees and tree seeds	5 13
Clearing land	544 80
Contingencies, including postage, $155.19	213 69
Printing and stationery	18 24
Books and newspapers	20 50
Drainage and drain tiles	15 20
Bee supplies	1 00
Telegrams and telephones	1 50
	7,534 11

SUMMARY OF EXPENDITURE, 1903-04.

Central Experimental Farm		$ 37,219 33
Nappan "		12,085 32
Brandon "		11,919 08
Indian Head "		9,675 28
Agassiz "		7,534 11

*General Expenditure.**

Distribution of seed grain, potatoes, &c., from Central Experimental Farm		$ 4,804 42	
Value of seeds from, seeds, grain, trees, &c		281 52	
" grain from Brandon	$ 362 02		
" " Indian Head	1,127 35		
" potatoes from Experimental Division C.E.F.	151 00		
	$1,640 37		
Less—Value of screenings charged feed for stock C.E.F	116 12		
		1,525 24	
			6,610 19
Entomological and Botanical Division, including salaries of officers in charge			4,098 81
Chemical Division, including salaries of officers in charge			4,720 22
Salaries general, including—			
Director, accountant, director's secretary and assistant accountant			6,137 51
			99,999 85
Printing bulletins and distribution of bulletins and reports		7,000 00	
Less—Special sum in estimates for this item		7,000 00	
			99,999 85

* These items are put under "General Expenditure" for the reason that they are incurred for general purposes.

SUMMARY OF STOCK, MACHINERY, IMPLEMENTS, &c., ON HAND DECEMBER 1, 1904.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

17 Horses	$ 3,415 00
18 Ayrshire cattle	2,035 00
13 Guernsey cattle	1,565 00
14 Durham cattle (Shorthorns)	3,175 00
8 Canadian cattle	950 00
16 Grade cattle	605 00
27 Yorkshire swine	728 00
9 Berkshire swine	340 00
7 Tamworth swine	200 00
70 Grade swine	382 00
28 Shropshire sheep	503 00
12 Leicester sheep	230 00
3 Grade sheep	12 00
Farm machinery and implements	3,071 75
Vehicles, including farm wagons and sleighs	1,079 00
Hand tools, hardware and sundries	1,152 15
Harness	588 45
Dairy department, machinery, &c	488 50
Horticultural and forestry departments, implements, tools, &c	658 50
Botanical department, implements, tools, &c	5 00
Poultry department, 222 fowls	353 00
Poultry department, implements, furnishings, &c	146 35
Bees and apiarian supplies	436 02
Chemical department, apparatus and chemicals	1,875 00
Books in several departments	572 86
Greenhouse plants, supplies, &c	2,229 50
Furniture at Director's house	1,100 00
Office furniture and stationery	1,676 25
Experimental flour mill and electric motor	4[illegible]5 00
	30,037 33

EXPERIMENTAL FARM, NAPPAN, N.S.

8 Horses	$ 1,085 00
4 Guernsey cattle	635 00
7 Holstein cattle	370 00
14 Ayrshire cattle	855 00
60 Grade cattle	1,960 00
4 Yorkshire swine	95 00
2 Berkshire swine	45 00
64 Grade swine	300 00
20 Sheep	240 00
77 Fowls	50 50
Bees and apiarian supplies	10 30
Vehicles, including farm wagons and sleighs	416 50
Farm machinery	547 50
Farm implements	207 00
Hand tools, hardware and sundries	363 50
Harness	213 50
Furniture for reception room and bedroom for visiting officials	129 00
Furniture supplies and books for office	85 00
	$ 7,607 80

EXPERIMENTAL FARM, BRANDON, MAN.

13 Horses	$ 1,400 00
3 Ayrshire cattle	175 00
7 Durham cattle	550 00
3 Guernsey cattle	175 00
9 Grade cattle	285 00
1 Tamworth pig	15 00
1 Berkshire pig	15 00
13 Yorkshire swine	90 00
8 Grade swine	30 00
100 Fowls	100 00
Bees and apiarian supplies	131 45
Vehicles, including farm wagons and sleighs	415 00
Farm machinery	2,136 33
Farm implements	728 00
Hand tools, hardware and sundries	654 05
Harness	219 25
Furniture for reception room and bedroom for visiting officials	161 55
Furniture supplies and books for office	287 30
	$ 7,567 93

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

12 Horses	$ 1,570 00
35 Durham cattle	1,960 00
23 Grade cattle	830 00
18 Berkshire swine	155 00
19 Tamworth swine	151 00
2 Yorkshire White swine	40 00
66 Fowls	66 00
Bees and apiarian supplies	25 75
Vehicles, including farm wagons and sleighs	551 00
Farm machinery	2,255 33
Farm implements	763 00
Hand tools, hardware and sundries	399 75
Harness	182 75
Furniture for reception room and bedroom for visiting officials	217 00
Furniture supplies and books for office	367 50
	$ 9,534 08

EXPERIMENTAL FARM, AGASSIZ, B.C.

6 Horses	$	650 00
12 Durham cattle		1,600 00
17 Dorset horned sheep		191 00
14 Berkshire swine		129 00
11 Yorkshire White swine		145 00
74 Fowls		68 00
Bees and apiarian supplies		54 75
Vehicles, including farm wagons		193 50
Farm machinery		643 00
Farm implements		104 50
Hand tools, hardware and sundries		137 70
Harness		116 00
Furniture for reception room and bedroom for visiting officials		151 15
Furniture supplies and books for office		124 00
	$	4,307 60

THOS. M. CRAMP, *Accountant.*

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EXPERIMENTAL FARMS

REPORTS

OF THE

DIRECTOR - - - - - - -	WM. SAUNDERS, LL.D.
AGRICULTURIST - - - - - -	J. H. GRISDALE, B. AGR.
HORTICULTURIST - - - - - -	W. T. MACOUN
CHEMIST - - - - - - -	F. T. SHUTT, M.A.
ENTOMOLOGIST AND BOTANIST - - - -	JAS. FLETCHER, LL.D.
EXPERIMENTALIST - - - - -	C. E. SAUNDERS, B.A., PH. D.
POULTRY MANAGER - - - - - - -	A. G. GILBERT
SUPT. EXPERIMENTAL FARM, NAPPAN, N.S. -	R. ROBERTSON
HORTICULTURIST " " " - -	W. S. BLAIR
SUPT. EXPERIMENTAL FARM, BRANDON, MAN. -	S. A. BEDFORD
" " " INDIAN HEAD, N.W.T.	ANGUS MACKAY
" " " AGASSIZ, B.C. - -	THOS. A. SHARPE

FOR

1903

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1904

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS

OTTAWA, December 1, 1903.

SIR,—I beg to submit for your approval the seventeenth annual report of the work done, and in progress, at the several experimental farms.

In addition to my report, you will find appended, reports from the following officers of the Central Experimental Farm: From the Agriculturist, Mr. J. H. Grisdale; from the Horticulturist, Mr. W. T. Macoun; from the Chemist, Mr. Frank T. Shutt; from the Entomologist and Botanist, Dr. James Fletcher, and from the Experimentalist, Dr. C. E. Saunders. A report is also submitted from the Poultry Manager, Mr. A. G. Gilbert.

From the Branch Experimental Farms there are reports from Mr. R. Robertson, Superintendent, and from Mr. W. S. Blair, Horticulturist of the Experimental Farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, Superintendent of the Experimental Farm for Manitoba, at Brandon; from Mr. Angus Mackay, Superintendent of the Experimental Farm for the North-west Territories, at Indian Head, and from Mr. Thos. A. Sharpe, Superintendent of the Experimental Farm for British Columbia, at Agassiz.

In these reports there will be found the results of many important and carefully conducted experiments in agriculture, horticulture and arboriculture, the outcome of practical and scientific work in the fields, barns, dairy and poultry buildings, orchards and plantations at the several experimental farms; also of scientific research in the chemical laboratory bearing on many branches of agricultural and horticultural work, and of information gained from the careful study of the life histories and habits of injurious insects and the methods by which noxious weeds are propagated and spread, together with the most practical and economical measures for their destruction. In the

report of the Entomologist and Botanist will also be found particulars of the experiments and observations which have been made during the past year in connection with the Apiary.

The large and constantly increasing demand by the farmers of the Dominion for the publications issued from the experimental farms, the rapidly extending correspondence and readiness shown by farmers everywhere to co-operate with the work of the farms in the testing of new and promising varieties of cereals furnish gratifying evidence of the desire for information and improvement among this class of the community, also of the high esteem in which the work of the farms is held. It is hoped that the facts brought together in the present issue will be found of much practical value to the Canadian farmer and fruit-grower and that they may assist in advancing agriculture and horticulture in this country.

I have the honour to be, sir,
Your obedient servant,

WM. SAUNDERS,
Director of Experimental Farms.

To the Honourable
The Minister of Agriculture,
Ottawa.

ANNUAL REPORT

OF THE

EXPERIMENTAL FARMS

REPORT OF THE DIRECTOR, WM. SAUNDERS, LL.D., F.R.S.C., F.L.S.

The results of farm operations in Canada in 1903 have, on the whole, been encouraging. While the wheat crop in the Canadian North-west has been reduced in volume, and the grade somewhat lowered by unfavourable weather, the higher prices which have prevailed have done much to make up both for the shortage and the injury. In the eastern provinces the returns have been larger, and most of the more important crops have given more than an average, and in the output of live stock and dairy products the increase has been general. The area of land under crop is increasing rapidly and the volume of agricultural exports becoming larger from year to year.

During the past seven years the exports of farm products have more than doubled. The articles in which the larger part of this increase has occurred are wheat, flour, pease, cattle, pork, poultry, cheese, butter and fruits. Along these lines the resources of Canada for the extension of trade are practically unlimited. With suitable climates, an enormous area of fertile land and a body of intelligent farmers earnest in their desire to improve their condition, and with an aptitude for acquiring practical information in all lines of farm work we may safely look for continued advancement.

It should, however, never be forgotten that we shall always have much to learn; and a striving for improvement in quality of product, in methods to economize the cost of production and to increase the output should never cease. There are competitors on every hand, and the search for new outlets for Canadian products should ever continue and we should always be ready to do our best to meet the wants and wishes of those who are willing to trade with us.

Canada has for many years been making steady progress, but in no branch of work has this been so evident as in that great national industry, agriculture. The governments of this country have been liberal in their efforts to assist the farmers to a better knowledge of their business, and to-day, as a whole, no farmers are better informed than those in Canada, and the results of the efforts which have been made for the farmers' advancement have laid the foundations for a prosperous condition of agriculture of which as yet we see only the beginning.

The efforts which have been made in connection with the experimental farms in the past, to help farmers to solve some of the problems and to successfully meet the difficulties common to farming, have been much appreciated and the work of the past year, as recorded in the pages of this seventeenth annual report, will, it is believd, furnish additional facts of great value. New matter is presented from every department, and continued efforts have been made to give to all the information gained, an application, as practical as possible, looking always to the improvement of agriculture and the making of the noble work of the farm more attractive and profitable.

THE LEADING CEREAL CROPS IN CANADA.

OATS.

The oat crop is the most important of all cereal crops in the eastern provinces. In Ontario it occupies a larger area than all other cereals combined. While the area devoted to fall and spring wheats in this province is gradually lessening, the oat acreage is constantly going up. In Quebec, next to hay it is much the most important of all crops. The area in barley also in Ontario is steadily increasing. The explanation of this probably lies in the fact that these two cereals which were at one time largely exported but are now almost entirely consumed on the farm have been found most economical and suitable for the feeding of dairy cows and swine, and for the fattening of steers. In Manitoba also the acreage in oats is increasing. In 1903 it amounted to 855,431 acres, with a total yield of 33,035,774 bushels, an average of 38·62 bushels per acre. In all the other provinces and territories it is also an important crop.

The increase in the acreage of oats has been associated with a considerable increase in the average crop. For the 19 years from 1882 to 1901 the average crop of oats in Ontario was 34 bushels 27 pounds per acre, while the crop for the past two years has averaged 42 bushels 5 pounds per acre. This is an average increase of 7 bushels 12 pounds per acre, which estimated at the value of 1 cent per pound, has added nearly two million dollars a year to the profits of oat growing in this province. This is a very good showing. Comparing Ontario with the States which border on either side, we find that in the state of New York the average for the ten years ending in 1900 was 28 bushels 27 pounds per acre, and for 1902 and 1903 an average of 37 bushels. In Michigan the average for the ten years ending with 1900 was 29·7, and for 1902 and 1903 an average of 35·2. In Wisconsin the average for the ten years ending with 1900 was 32·9 and for 1902 and 1903, an average of 36·4. From these figures it will be seen that Ontario is well above its neighbours in the yield obtained from the land devoted to oats.

To gain information as to the most productive and profitable oats to grow, promising sorts have been brought together for test from all countries. About 60 varieties have been under trial during the past eight or nine years at each of the experimental farms, where they have been grown side by side under practically uniform conditions, and their relative earliness, productiveness and quality ascertained. From year to year the records of the results of this work are carefully gone over and any varieties which may have fallen for some years below a certain high standard of average productiveness are dropped from the list, thus bringing more prominently before the farmers of Canada those sorts which have been found to be most productive. The best of those on the list are grown in considerable quantities every year to supply the samples which are sent free to every farmer who applies.

At the experimental farms larger crops have been grown than the average reached by the several provinces.

At the Central Farm, at Ottawa, the average yield of all the varieties tested in 1903 on the experimental plots was 62 bushels 9 pounds, and the best twelve sorts gave an average of 73 bushels 6 pounds per acre; on a field of 39 acres of Banner oats 57 bushels 9 pounds per acre were obtained.

At the Nappan Experimental Farm, in Nova Scotia, the average yield of all the varieties tested on experimental plots was 81 bushels 18 pounds per acre, and that of the best twelve varieties 94 bushels 27 pounds. The field crops on that farm have run from 65 to 70 bushels per acre.

At the experimental farm at Brandon, Manitoba, the average yield on experimental plots of all the varieties tried was 97 bushels 4 pounds per acre, and that of the best twelve varieties 110 bushels 28 pounds. In field crops the yields have varied from 73 bushels 18 pounds to 86 bushels 18 pounds per acre.

At the experimental farm at Indian Head, North-west Territories, the average of all the varieties on experimental plots was 117 bushel 23 pounds and that of the best twelve sorts 128 bushels 26 pounds per acre.

In field crops, 5 acres of Banner gave an average of 119 bushels 2 pounds per acre, and 3 acres of Abundance, an average of 106 bushels. The other varieties under field culture varied from 98 bushels 14 pounds to 82 bushels 3 pounds per acre. Taking into account the whole of the field crops (36 acres) the average yield has been 95 bushels 8 pounds per acre.

At the experimental farm at Agassiz, British Columbia, the average crop of all the varieties tested in experimental plots was 66 bushels 4 pounds per acre, and that of the best twelve sorts 77 bushels 12 pounds per acre.

Among the varieties which have given the heaviest crops are the Banner, Wide Awake, Improved Ligowo, Abundance, Tartar King, Waverley and Thousand Dollar and provision has been made to give these varieties a wide distribution during the coming season.

The Banner oat is a variety which has done remarkably well. During the past nine years it has given an average on the experimental plots on all the farms of 78 bushels 25 pounds per acre and in all the field crops at all the farms during the same period an average of 71 bushels 10 pounds per acre.

The Banner oat is also attracting attention in Great Britain. In 1899, in response to a request from Prof. Patrick Wright, Principal of the Agricultural College of Glasgow, samples of some of the best sorts of oats cultivated in Canada were sent to him from the experimental farm to be grown for comparison with the best sorts cultivated in Scotland. Prof. Wright's reports show that from the outset the Banner oat took a leading position among the many varieties he was growing, and the next year a request came from him for twelve bushels for further trial, and in the year following for fifty bushels more. These were distributed among a number of leading farmers in different parts of Scotland, and the reports published were so favourable that a great demand was created for the seed and several large orders were received by seed firms in Canada last year for these oats for use in Great Britain. In a recent letter from Prof. Wright, he says: 'It may interest you to know that the Banner oat has now taken an assured position among the oats cultivated in Britain, and has proved itself to be equal to, if not better, than any other oat we have.'

Another of the varieties sent to Scotland from here is also attracting notice. This is the 'Wide-awake.' Of this variety in a recent letter Prof. Wright speaks as follows: 'In our last season's trials a remarkably good result is shown in our tables by the 'Wide-awake' oat of which we also got the original seed from you. It has done so well that I am writing you now to ask if you would be good enough to get sent to me without delay twenty quarters (160 bushels) to be used as seed this season.' I succeeded in getting fifty bushels, which were sent in good time for sowing. In a letter of March 17, he says: 'If this oat does as well with us next year as last, it is also likely with the Banner, to pass into general cultivation here.' It is gratifying to know that we are thus helping farmers in the mother country with Canadian varieties of a very productive and valuable character.

In estimating the value of an oat the relative weight of kernel and hull must be considered. This will vary with the variety and with the weight per bushel of the sample. The lighter the weight per bushel the larger is the proportion of hull. In a very light sample, weighing about 20 pounds to the bushel, the proportion of hull has been found to be over 50 per cent, whereas the same variety of the standard weight (34 pounds per bushel) would only have about 30 per cent of hull.

The Banner is generally regarded as a thick-hulled oat, but in our experience it is only medium in this respect. In the following table the varieties which were most largely distributed from the Central Experimental Farm in 1903, are referred to, and their place of growth, weight per bushel and proportion of hull given. The Tartar

King, Waverley and Goldfinder are varieties recently introduced by Garton Bros., England:—

Name of Variety.	Where grown.	Weight per Bushel.	Proportion of Hull.
		Lbs.	Per cent.
Banner	Ottawa	42½	28·6
"	Indian Head	44½	29·7
Improved Ligowo	Ottawa	44½	26·6
"	Indian Head	46½	26
Wide Awake	"	46½	28
Tartar King *	Ottawa	37½	34·3
"	Indian Head	46¾	28
"	As imported from England.	39½	30·9
Waverley	Ottawa	41	26·3
"	Indian Head	46½	26·7
Goldfinder	Ottawa	39	28·6
"	Indian Head	42	28·1
"	As imported	35	24·9

In some instances there seems a tendency to produce a somewhat thicker hull in this country; in others a thinner one. Investigations have not yet gone far enough along this line to permit of any decided opinion on this subject. One point which our examinations seem to prove is this: that as a rule the actual weight of hull in a given number of kernels of any one variety of oats is practically the same, whether the oat weigh 30 or 40 pounds per bushel, and the difference in weight is made up in the size of the kernel. This, after all, is not a matter of much surprise, when we look carefully into the subject. When an oat during its growth heads out, the husk is of full size, and the framework for holding the kernel is all there. The covering for the future oat is fully developed, the flower is produced in the cavity prepared for it, fertilization takes place, followed by the growth to maturity of the kernel. The plumper the kernel, the heavier is the oat.

ANALYSIS OF HULLS AND KERNELS.

What gives to this subject the greatest importance is the fact that the hull contains a very small proportion of nutritive matter. The quantity of albuminoids or flesh-forming constituents and of fat in oat hulls is not much more than half of what is found in oat straw. Oat hulls, according to Henry, contain 3·3 per cent of total albuminoids. Mr. Shutt, the Chemist of the experimental farms, finds this to be only 2·6 per cent in Canadian oats, while in oat straw the average of six analyses gives 4·1, and for the kernel of the oat, 14·51, showing the immense difference in feeding value between the husk or hull and the kernel, and pointing to the importance of growing the plumpest and most productive sorts. The proportion of fat in the hull is relatively less. While the kernels contain 6·24 per cent of fat and the oat straw 2·1 per cent, the proportion of fat, as given by Henry, is 1 per cent in the hull, and by Shutt, ·78 per cent (a trifle over ¾ of 1 per cent). I append the results of Mr. Shutt's analysis, which is of the Banner oat grown in Ottawa in 1902.

* The Tartar King has a stiff straw and evidently has a larger proportion of hull than most other oats which we have tested.

CROP OF 1902, C.E.F.

Proportion of kernels to hulls:

Kernels	71·92
Hulls	28·08
	100·00

—	Moisture.	Albuminoids.	Fat.	Carbohydrates.	Fibre.	Ash.
Oats (whole grain)	12·74	11·22	4·82	58·81	9·47	2·91
Kernels	12·03	14·51	6·24	63·15	1·93	2·14
Hulls	10·19	2·60	0·78	49·63	31·63	5·17

From the facts submitted it will be seen that heavy oats are worth a higher price than light oats, as in buying them the purchaser gets a larger proportion of the highly nutritious kernels. The kernel contains nearly six times as much albuminoids as the hulls and eight times as much fat. It will also be noted that judging from the crops produced at the experimental farms a further increase in the average yield of oats per acre in the provinces and territories may be looked for when the conditions involved in the production of good crops are more carefully and fully complied with.

Wheat.

While the oat is so highly important among the crops in the east, wheat holds a corresponding position of importance in the west, where much the larger area is occupied by this crop.

The wheats grown throughout the world consist mainly of five different species and their varieties. *Triticum vulgare,* in which are included most of the spring and winter wheats cultivated in America, Great Britain, in many of the European countries, and in Australia, for the making of bread. *Triticum durum,* a class of wheats which are hard and rice-like, represented in this country by such varieties as Goose wheat, Kubanka, Gharnovka, Velvet Don and others. These are valuable wheats for macaroni and pastry, and are used in some countries for bread. Large quantities of these wheats are grown in Southern Europe, and recently they have been introduced into some of the western United States, where they have been grown with some success. They have also been tested in Canada. They are less liable to rust than other wheats, but their cultivation has been discouraged by millers, on the ground that they are of inferior quality and unsuitable for bread-making.

A third species is known as *Triticum polonicum* or Polish wheat, which produces large kernels and large loose heads. The grain is hard and flinty, resembling in this respect the macaroni wheats.

The fourth group of wheats are known as Emmers *Triticum dicoccum* and the fifth as Spelts *Triticum spelta.* These five groups include all the varieties grown.

The origin of the wheat plant is unknown. There does not appear to be any reliable records of any of the varieties having been found growing in a wild state, but some of them have been in cultivation since very early times. The earliest mention of wheat in the Bible is in Genesis, chap. 30, v. 14. The Spelt wheats were grown by the ancient Egyptians and are still much cultivated in some of the mountain districts in Europe. The importance of the wheat crop may be gathered from the quantity produced and consumed in the world. It is certainly the most important of all the world's crops and the most valuable to mankind of all cereals. The total crop for the entire world in 1903 is given as 3,258,688,000 bushels.

The season of 1903 has not been quite so favourable to the farmers of Manitoba and the North-west Territories as those of the past two years. In 1903 the total area of wheat sown in Manitoba was 2,442,873 acres, which returned a crop of 40,116,878 bushels, the average yield being 16·42 bushels per acre. This is 12,960,389 bushels less than was produced in 1902. In the North-west Territories the acreage under wheat was 837,234, and the average crop, 19 bushels, representing a total output of 16,029,149 bushels. This added to the crop of Manitoba, makes a total wheat crop for 1903 of 56,146,027 bushels, a decrease in wheat yield, when compared with the crop of 1902, of 10,888,090.

In Ontario the land devoted to winter wheat in 1903 was 665,028 acres, which produced a total crop of 17,787,169 bushels, being an average of 26·7 bushels per acre. Spring wheat occupied 248,518 acres which produced 4,797,274 bushels, an average of 19·3 bushels per acre. Total area in wheat in Ontario, 913,576 acres, total crop, 22,584,443 bushels. The wheat crop in Quebec, the Maritime provinces and British Columbia, although growing in volume, occupies as yet only a small proportion of the acreage under cultivation.

The higher prices realized this season for wheat have done much to make up for a shortage in yield, and a larger area of land than ever before has been prepared for the crop of the coming year.

While the eastern provinces will probably always have surplus wheat to export, it is to the north-west country we must look for the greater volume of exports of this valued cereal, since the area suitable for wheat culture there is enormous, and owing to advantages in soil and climate the wheat grown there is of higher quality and commands a higher price than that grown in the east.

SOME OF CANADA'S VAST AREAS OF FARM LANDS.

The area of land suitable for the growing of agricultural crops in Canada is so vast that when presented in figures the mind needs much training before their full significance can be grasped. The civilized world is gradually awakening to a somewhat hazy perception of the immense wealth laid up in the many millions of acres of fertile lands unoccupied here and large numbers of immigrants are flocking to our shores. The great North-west country is a huge field for future enterprise, as yet very imperfectly understood even among our own people.

The following figures as to the quantity of land fit for settlement in the province of Manitoba and the three provisional territories, Assiniboia, Saskatchewan and Alberta, have been obtained from official sources and may be accepted as approximately correct for the areas in question:—

—	Total Area exclusive of Water.	Estimated Proportion suitable for Cultivation.	
	Acres.		Acres.
Manitoba	41,000,000	Two-third equal to	27,000,000
Assiniboia	57,000,000	Seven-eighths "	50,000,000
Saskatchewan	70,000,000	Three-fourths "	52,000,000
Alberta	64,000,000	Two-thirds "	42,000,000
		Total	171,000,000

It is thus estimated that there are within the limits referred to, after making allowance for lands unfit for agriculture, about 171 million acres suitable for cultivation, by which is meant land of such a degree of fertility as to admit of profitable farming. While referring here only to the possibilities of agricultural progress within

this area, where the quality of the soil and the conditions of climate are fairly well known, we should not deal justly were we to pass over the great north country lying beyond the boundaries of Saskatchewan and Alberta without a few words of explanation.

The 155 million acres of land in Athabaska, and the 340 million acres in Mackenzie, will no doubt prove important factors in the future development of Canada; but what proportion of these vast districts will be capable of the profitable growing of crops is as yet a matter of conjecture. There are, however, some proofs available showing that it is possible to grow cereals to some extent in portions of these remote districts of which our knowledge is so fragmentary.

The writer has received samples grown at Dunvegan, on the Peace river, in Athabaska, 414 miles by latitude north of Winnipeg, of Ladoga wheat plump and well matured, weighing 64 pounds per bushel. From Fort Vermillion, further down the Peace river, also in Athabaska, 591 miles north of Winnipeg, Ladoga wheat has been raised weighing 60 pounds per bushel.

Considerable quantities of wheat have of late been grown by settlers in the Peace river valley, especially near Vermillion, where there is said to be a considerable area of land suitable for wheat growing. The Hudson's Bay Company have built a good roller mill at Vermillion, with a capacity of twenty barrels of flour per day, and have paid $1.50 per bushel for all the wheat grown in that vicinity this year. This has been done with the hope of being able to supply their northern posts with flour from this district. The quantity of wheat grown there this year is estimated at 7,500 bushels. One of the settlers, Mr. F. S. Lawrence, of Vermillion, claims to have had this season about 40 bushels per acre from 50 acres of his wheat land.*

From Fort Simpson, in Mackenzie, 818 miles north of Winnipeg, by latitude, Ladoga wheat has been obtained which weighed 62½ pounds per bushel. In this instance a small percentage of the grain was injured by frost. This is the furthest point north from which samples of wheat have been received. The time between sowing and harvesting in these far northern districts is in some instances less than it is at the experimental farm at Ottawa. At Dunvegan the wheat was sown May 7, and harvested August 21, giving a growing period of 101 days. The same sort of wheat grown at Ottawa, taking the average of three years, requires 106 days. At Fort Vermillion the time between sowing and harvesting was also 101 days, and at Fort Simpson the wheat was sown June 7, and harvested September 22, giving a growing period of 107 days.

The long days are an important factor in bringing about this result, the influence of increased periods of light hastens the ripening of cereals very much. This view is supported by facts brought together during a careful series of observations made some years ago by a distinguished Russian investigator, Kowalewski. He experimented with spring wheat and oats, growing them in different parts of Russia, from the far north, at Arkangelsk to the southern province of Kherson. He found that in the higher latitudes the grain ripens in a shorter period than in the more southern districts, the difference varying at different points from 12 to 35 days. This author attributes the earlier ripening in the north largely to the influence of light during the long summer days. He also believes that the short seasons of quick growth have gradually brought about in these cereals an early ripening habit. In our experience with early ripening cereals, this habit is a permanent characteristic which they continue to manifest when grown in localities where the summer season is longer.

Returning again to the smaller and better known districts, Manitoba and the three provisional territories in which are included the 171 million acres which are said to be suitable for cultivation, we find that a very small proportion of this land less than four per cent, has yet been brought under crop. It does not follow that all the land fit for settlement within the area referred to is suitable for wheat growing. There are some

*I am indebted to Mr. J. M. Macoun, of the Geological and Natural History Survey, who has recently returned from exploring parts of the Peace river valley, for these items of information.

localities where the season is too short to make wheat a sure crop and farmers in such districts will find it more profitable to carry on mixed farming; but from the good crops which have been harvested during some years past in most of the settled or partly settled regions, within this area, it is evident that the greater part of the country is well suited for the growing of wheat of high quality.

Another consideration which would reduce the area annually available for wheat is that the land, to get the best results, should be summer-fallowed every third season. Further, while many excellent farmers advocate the growing of two crops of wheat in succession, one on fallowed land, the second on stubble, to be followed by fallow, it may be found more profitable in some localities to grow wheat in rotation with other crops.

Making allowances for all these requirements, the fact still remains, that the resources of Canada in wheat lands are enormous.

The total wheat crop of the United States for 1903 was 637,821,835 bushels, sufficient to feed a population of about 80 millions and leave a margin of about 235 million bushels for export. This wheat was all grown on less than 50 million acres of land. Furthermore the yield per acre of wheat in Canada is larger than it is in the United States. In 1902 and 1903 the average crop given for the whole of the United States, including winter and spring wheat, is about 14 bushels per acre. That this yield for the past two years is not abnormal is shown by the fact that the average for the past ten years has been 13·53 bushels per acre.

Ontario and Manitoba are the only two provinces for which statistics are available for these periods. In 1902 and 1903 the average crop of winter wheat in Ontario was 26·4 bushels, and of spring wheat 19·3 bushels per acre, and for the same years in Manitoba where only spring wheat is grown an average of 21·21 bushels.

The average of a ten years' record tells much the same story. The average yield of winter wheat in Ontario for the past ten years was 21·52 bushels per acre, and of spring wheat 16·64 bushels. In Manitoba the average for the past ten years has been a little over 20 bushels per acre. Comparing this with the states bordering on Manitoba we find that the average yield per acre of wheat in Minnesota for the past ten years has been 14·33 bushels, in North Dakota 12·87 bushels and in South Dakota 10·67 bushels per acre. This larger yield in Canada is no doubt partly due to the land being more productive and partly to a more favourable climate, and in some measure to better farming. Were one-fourth of the 171 million acres said to be suitable for cultivation in Manitoba and the three provisional territories under crop with wheat annually, and the average production equal to that of Manitoba for the past ten years, the total crop would be 855 million bushels annually, which would place Canada in the position of being much the largest wheat producing country in the world. These figures deal only with a portion of the west, and do not take into account the wheat-growing areas in the large eastern provinces.

Under the climatic conditions which prevail in the Canadian North-west, wheat of excellent quality is grown, which is much sought after by millers to mix with the flour of wheat of lower grades, so that a desirable and uniform strength may be maintained in the flour they produce. This strength in flour, which is so highly developed in that made from No. 1 Hard wheat grown in the North-west, is due to the presence of a large proportion of gluten of high quality. The relative proportions of the more important constituents in wheat will depend on the character and tendencies of the individual variety, the climatic conditions under which it is grown, and the fertility of the soil. The chief constituents of wheat are gluten, starch and fat, all highly nutritious in their character. Starch forms the larger portion of the substance of the grain, ranging in spring wheat from 65 to 68 per cent; gluten from 11 to about 15; and fat from about 1¾ to 2¼ per cent. Winter wheat contains a larger proportion of starch, from 70 to 74 per cent, and a smaller proportion of gluten, from 6 to 9 per cent. The proportion of fat is much the same in both classes of wheat. When a number of different sorts of wheat are grown side by side and under the same conditions, some will be found to contain a larger proportion of gluten, others a more abundant deposit of starch. In the

better sorts of spring wheat, when grown in northern latitudes, where the summer season is short and the growth rapid, the proportion of gluten is usually increased and under such conditions the grain improves in quality. The gluten exists in the kernel in the form of an irregular frame-work, which extends throughout the substance of the grain, firmly packed with clusters of starch granules. The frame-work of glutinous matter is formed in the early stages of the growth of the berry, and the starch granules are subsequently deposited in the interspaces. In the preparation of flour the berry is crushed, the exterior is separated as bran or shorts, while the interior contents form the fine flour for bread-making. The starch in flour may be separated from the gluten by the simple process of washing with water, whereby the starch granules are removed and the gluten remains as a sticky mass. By working this with the fingers under a gentle stream of water, the starch may be entirely removed and the proportion of moist gluten determined. The starch contains no nitrogen, but the gluten is highly nitrogenous and a most excellent nutrient and flesh-former.

Chemical analyses of gluten have shown that it consists of two different principles, known as gliadin and glutenin, and it is from the combination of these in the best proportion that the highest quality of gluten results. Hence, while the percentage of gluten may be regarded in a general way as indicating the quality of a wheat, a high percentage of this substance is not always a sure indication of the milling value of the sample. Both the percentage and quality must be had to produce a flour which will give to bread made from it that tenacity which results in a light, porous white loaf of the most highly esteemed character. The best spring wheats grown in the Canadian North-west are noted for the high quality of gluten they contain and hence are in great demand.

REVIEW OF THE WORK WITH WHEAT AT THE EXPERIMENTAL FARMS.

At the experimental farms persistent efforts have been made from the outset to bring together from different countries the best and most promising sorts of wheat for trial, the qualities particularly sought being productiveness, earliness, and strength of flour. These varieties have been grown side by side, under similar conditions, so that their relative value might be determined.

Among the spring wheats commonly grown at the time the farms were established none was so highly or justly esteemed as the Red Fife, and the position it still holds is a pre-eminent one. It is remarkable for its productiveness, for its high quality, and for its power of adapting itself to varying conditions of soil and climate. This wheat originated about sixty years ago, as a chance discovery with Mr. David Fife, of Otonabee, Ontario, and hence has been in cultivation for more than half a century, and it does not show any tendency to deterioration. It gives as large a crop and is as high in quality as it ever was. It was taken from Ontario to Manitoba and the North-west Territories, where it is believed to have improved in quality, and as grown there, stands probably higher in the estimation of millers for the making of flour than any other known variety.

To preserve Red Fife in a state of purity by hand-picking in the field, has been one of the lines of work carried on persistently at the experimental farms.

While the Red Fife has so many points of excellence, it is open to one objection, which sometimes proves a very serious drawback to its cultivation. It is rather late in ripening and during the past fifteen or twenty years there have been several seasons when early frosts in the North-west have injured the grain so as to reduce its value very materially. Whenever this has occurred an outcry has been made by the farmers who have suffered, for an earlier ripening wheat.

In the endeavour to meet this demand varieties of wheat have been brought to Canada from many different countries, and grown for many years at all the experimental farms, alongside of the Red Fife and other well known sorts and their periods of ripening and weight of crop carefully recorded. Some wheats have been brought from the

colder districts in Northern Russia, verging on the Arctic circle, some from other countries in the northern parts of Europe, others from different altitudes in the Himalaya mountains, in India, from 500 to as high as 11,000 feet, which is about the limit for wheat-growing in that range. Other wheats have been obtained in the northern United States, from Australia, Japan and elsewhere.

Both the Russian and Indian wheats have usually ripened earlier than the Red Fife, but some have been inferior in quality, and others have given such small crops that the growing of most of them has been abandoned. Those we have had from Australia, also those from the North-western States, have been as late as, and many of them later than the Red Fife, and show no advantages over that variety. Every promising sort obtainable has been tested under the different climatic conditions existing in Canada, without finding a single earlier-ripening sort in cultivation elsewhere having the high quality and productiveness of the Red Fife.

THE BREEDING OF NEW WHEATS.

Another method by which we have sought to obtain the desired end has been by the cross-breeding of wheats, with the object of combining the good qualities of two or more varieties. It was on July 19, 1888, when the first experiments were begun in the cross-breeding of wheat on the experimental farm and since that time several hundred new sorts have been produced and tested. In originating many of these new productions the Red Fife has been chosen as one of the parents. One of the earlier importations from Northern Russia was the Ladoga, a wheat which after a thorough test proved on an average to be about a week earlier in ripening than the Red Fife; it was also fairly productive, but the colour of the flour made from it was not so white as that made from the Red Fife. It has, however, served a good purpose in the far northern districts, where its earliness of ripening has commended it to the settlers. The slightly yellow colour of the flour, which was the chief objection to its use here, was no drawback to it there, since it makes excellent bread. Samples of this Russian importation were early sent from the experimental farm to settlers in the Peace river district, and the Ladoga is said to be the only variety of wheat now grown in all that country. A considerable number of crosses were also produced between Ladoga and Red Fife, the most promising of which were multiplied until plots of considerable size could be grown. These were subject to rigid inspection from year to year, the less desirable sorts being promptly discarded, so as to keep the number of varieties under trial within reasonable bounds.

Among the most promising of the numerous progeny from this parentage are the varieties known as Preston and Stanley. The Preston is a bearded sort. The Stanley is beardless. Taking the average yield obtained on the experimental plots on all the experimental farms for a period of nine years, the Preston has given a crop of 34 bushels 41 pounds per acre, while the Red Fife has given 33 bushels 7 pounds per acre, a difference of 1 bushel 34 pounds in favour of the Preston. The Preston has also ripened uniformly earlier, the gain in time of ripening averaging from four to six days.

The Stanley is a twin wheat with the Preston, both having had origin in the one kernel. The plant grown from the cross-bred kernel the first season produced heads which were uniformly bearded; but when the seed from this was sown the year following, some plants produced bearded heads and others beardless. Subsequently these two varieties were bred to type by discarding all the variations produced until the types became fixed. Stanley, during a nine years' test, has given an average crop of 32 bushels 2 pounds per acre, which is 1 bushel 5 pounds less than Red Fife for the same period. In earliness of ripening this variety is about the same as the Preston.

The White Fife, which has averaged 8 pounds per acre more than Red Fife, during a nine years' trial, is grown to a considerable extent in some parts of Manitoba and the North-west Territories; but, although highly esteemed by some, it is not held to be equal in quality to the Red Fife. This variety was also crossed with the Ladoga and the best results obtained were Huron and Percy. Huron is a bearded variety which has also

proven productive and early. During a nine years' test it has given a slightly larger crop than Red Fife, exceeding that variety by 4 pounds per acre. It has also matured from four to five days earlier. Percy has given an average crop during the nine years' trial of 31 bushels 30 pounds per acre, which is 1 bushel 37 pounds per acre less than Red Fife for the same time. This also ripens earlier than Red Fife by from four to five days.

Another variety, known as Early Riga, was obtained by crossing one of the East Indian wheats, named Gehun, brought from a high elevation in the Himalayas, 11,000 feet, with a Russian wheat known as Onega. The Onega was brought from near Archangel, one of the most northerly wheat growing districts in Rusisa. These were both early varieties, but were not very productive. The Early Riga was the best sort produced from this cross and has proved to be one of the earliest ripening wheats known. During the five years it has been under trial it has ripened on an average from eight to nine days earlier than Red Fife. It is also fairly productive, having given an average crop for five years at all the experimental farms of 31 bushels 2 pounds per acre, being 2 bushels 5 pounds less than Red Fife for the same.

MILLING TESTS OF WHEAT.

The next point to consider is the quality of these cross-bred wheats and how they compare with Red Fife. To gain information on this point, three lots of samples were put up, consisting of two of Red Fife carefully cleaned and of the very best quality, with two each of Preston, Stanley and Percy. One of these was grown at Ottawa, Ont. ; the other at Indian Head, N.W.T. One lot of samples was submitted to Mr. Julicher, the well known wheat expert of the Pillsbury-Washburn Flour Mills Co., of Minneapolis, Minn. A second lot was sent to Lord Strathcona, High Commissioner for Canada, London, England, with a request that they be submitted to one of the best English wheat experts. The third lot was handed to the Chemist of the experimental farms, Mr. F. T. Shutt, for analysis.

I am much indebted to Mr. L. P. Hubbard, of the Pillsbury-Washburn Flour Mills Company, Limited, for the privilege of sending samples of Canadian wheats to be tested by their expert, Mr. J. H. Julicher. The samples sent were all forwarded under numbers, and no information was given as to the varieties submitted. In presenting Mr. Julicher's report, I have placed the names of the wheats after the numbers under which the samples were forwarded, so that the readers of the report may know to which they refer.

	Dough.		Gluten.		Quantity.	Quality.
	Quality.	Action in Washing.	Density.	Colour.		
					p.c.	
No. 7 (Red Fife, Ottawa)	White	Excellent.	Excellent.	White	11·8	101
" 3 (Red Fife, Indian Head)	White	Excellent.	Excellent.	White	11·9	101
" 6 (Preston, Ottawa)	Creamy	Good	Good	Creamy white.	11·9	100
" 2 (Preston, Indian Head)	Yellow	Good	Good	Creamy	11·9	100
" 8 (Stanley, Ottawa)	Creamy	Good	Good	Creamy white.	12·9	100
" 4 (Stanley, Indian Head)	Yellow	Good	Good	Creamy	12·4	100
" 5 (Percy, Ottawa)	Yellow	Good	Fair	Creamy	13·3	100
" 1 (Percy, Indian Head)	Yellow	Good	Good	Creamy	12·4	100

The samples marked 1 (Percy), 2 (Preston, I.H.) and 4 (Stanley, I.H.) are good wheats, but the others are better. I would favour 3 (Red Fife, I.H.) and 7 (Red Fife, Ottawa). In my opinion 3, 7 and 8 (the two Red Fifes and Stanley, Ottawa) would be excellent for milling, and bread made from flour of these would be very hard to match for quality, colour and strength.

J. H. JULICHER.

March 24, 1903.

These were all classed, as to condition, as very dry.

By reference to the table, it will be seen that the Red Fife from Indian Head and the Red Fife grown at Ottawa are graded exactly in the same terms, which was a matter of surprise to me as I had understood that the Red Fife grown in the east was not equal in quality to that grown in the north-west. I am told, however, that the season of 1902 was somewhat exceptional in that respect, and that the difference in quality between Red Fife grown in the west and that grown in the east was less that year than usual, the conditions having been such as to give to eastern samples a relatively higher quality.

While the dough of the flour of the Red Fife was pronounced white, and the gluten white and excellent, that from the Preston from Ottawa was rated as creamy and good, with good creamy white gluten. The dough from the Preston from Indian Head is said to be yellow and good, and the gluten as good and creamy, indicating a slightly better quality in the Ottawa-grown sample.

Mr. Julicher says that the samples marked '1,' Percy, and '2,' Preston, Indian Head, and '4,' Stanley, are good wheats, but others are better. He states that he would favour '3,' that is Red Fife, Indian Head, and '7,' Red Fife, Ottawa, and he says, 'In my opinion "3," "7" and "8"'—which are the two Fifes and the Stanley at Ottawa—'would be excellent for milling and bread made from the flour of these would be very hard to match for colour, quality and strength.' The Stanley, which he puts with the Red Fifes, is a twin wheat with the Preston. It is graded by Mr. Julicher as a trifle better than Preston, although he pronounces them all to be good wheats.

REPORT OF AN ENGLISH EXPERT.

The samples sent to Lord Strathcona were submitted by him to Mr. William Halliwell. In a letter received from his Lordship he says: 'I now forward you the report of Mr. William Halliwell on the eight samples of wheat which you sent me. Mr. Halliwell is the technical editor of *The Miller*. He is lecturer on flour milling to the London County Council, registered teacher of milling technology at the city and Guilds Institute, and may therefore, I think, be regarded as a competent authority. He has, moreover, had twenty-five years' experience of practical flour milling and wheat buying.

'I also inclose for your information a copy of the letter Mr. Halliwell wrote when sending me his report.'

Mr. Halliwell writes as follows:—

'ROOKWOOD, ROMFORD, May 22, 1903

'W. L. GRIFFITH, ESQ.,

'DEAR SIR,—I beg to forward you the result of my examination of the eight samples of Canadian wheat you were good enough to send me some days ago.

'I have given them special attention from a practical miller's point of view, and I hope you will find the results to be of benefit to Canadian wheat-growers generally. There is an unlimited market for the best sorts of wheat in this country and when my report is published I hope proper emphasis will be laid upon this point. Pure high-class samples will be preferred to those from any other source, as these wheats from the Canadian North-west are constantly growing in favour with the millers of this country.

'Yours faithfully,

(Signed) WILLIAM HALLIWELL.

In the letter to Lord Strathcona which accompanied the samples an item of information was given as to where these samples had been grown. I told him that samples one to four were from the North-west Territories and that samples five to eight were the same wheats grown in eastern Canada.

Mr. Halliwell's report is as follows:—

'Critical examination of eight samples of Canadian wheat:

'For strength, as viewed from the outside, from cutting the grains, and from reducing them to powder, I find they come out as follows: The samples are numbered 1 to 8. Four of them (1 to 4) are from Indian Head Farm and are called regular samples of No. 1 wheat. The other four (5 to 8) are from the Government Experimental farm at Ottawa. One to four are almost equal and may be classed as their numbers indicate, there being a just perceptible difference—but not enough I should say, to make a difference in the general selling price on our English markets. Following these I put the experimental samples (from Ottawa) in the following order, namely: 6, 5, 8, 7, and I might add that their general excellence is much better than one would expect to find from their outside appearance alone. In no case, however, would the latter numbers be sold for the price of those numbered 1 to 4. In making this statement, I am bearing in mind that the chief ingredient required in Canadian wheat is gluten or strength, given that the nature of the wheat also guarantees a maximum of the other attributes which millers expect to find and do find in well developed Canadian grown grain. Speaking as a miller, I also am of opinion that the Indian Head samples (1 to 4) will yield more middlings, of larger and more even size, and of better shape and all round quality than those grown on the experimental farm at Ottawa. There would also be less break flour—a thing all millers try to avoid making, seeing that this quality of breaking flour is only akin to the lowest grade. I may explain this more clearly by saying that the object of all millers is to make middlings first and flour afterwards. Middlings can be purified and so prepared for conversion into the highest grades of patent flour, whereas if the structure of the wheat does not lend itself quite so readily to this performance, but is apt to be too easily disintegrated on the break rolls, the result means flour, and that of a much lower quality, seeing that it cannot be sent to the purifiers at all, therefore I say that according to my judgment, the break flour would be less in the first four samples. Going a step farther, I am of the opinion that the middlings made from the Indian Head samples would grade better—would be more even in size, in texture and in gravity. These are the three primary considerations which govern the successful milling operations, and they are ever present when buying high class wheat for milling purposes. Wheat particles—middlings—which grade well, are always found in the largest quantity at the head of the mill, where the highest priced patent flour is made. The wheats from the experimental farm at Ottawa do not, in my opinion, possess all these qualifications in the highest degree. They are not quite so compact in their structure, or in other words, they are of a slightly more mellow nature and are rather more inclined to break up more quickly, and also into more sizes, smaller sizes in fact, and thus there would be a tendency towards them being conveyed lower down the milling system before being converted into flour. This, of course, means that the larger percentage would be graded as second patents. To my mind, it appears as if the Indian Head wheats were grown under the better natural conditions and in quite different soil.'

'In the simple matter of flour yield, however, the Ottawa wheats are undoubtedly first, but, as I may be permitted to remark, mere flour yield is not the sole consideration regarding the buying of Canadian wheats. What we require first of all is strength, and given this, yield and colour follow as a natural consequence. When examining the various samples as intended for the purifiers, I still pin my faith to the Indian Head samples. They—as broken up by the millers break rolls—are more free from bran snips, more free from adhering bits of the branny coating, and are thus more easily operated upon, giving to the purifiers a slightly larger constant capacity, and, as I have already pointed out, this capacity is needed on account of the larger quantity of middlings made, yet at the same time, it is the highest recommendation because this larger quantity is to be made into patent or high class flour. Having been through the purifiers, the more compact middlings (Indian Head samples again)

go straight to the reduction rolls, and are immediately reduced to flour, whereas whenever there is the slightest mellowness—or weakness I may call it—the flour does not get to the sack quite so quickly. Strictly, however, it is a question of strength, pure and simple, and I have endeavoured to point out my conclusions on that head particularly. Whichever wheat is strongest will get to the flour sack quickest. Patent flour is made where the strength is supposed to be, and when buying strong wheat, millers look to the points I have enumerated.

'I have also compared the eight samples with others on the London Corn Exchange at the present time (May 21). I have been at the trouble to work them side by side in the examination just given, and I find that for strength (the ruling characteristic) Nos. 1, 3 and 4 would sell off Mark Lane stands at 34s. 3d. per 496 pounds; No. 2, 34s.; Nos. 5 and 7 at 33s. 9d., and Nos. 6 and 8 at 33s. 6d. A comparison with Canadian shippers' figures may be interesting. This will be best made by those more intimately interested.

'In order to put my meaning in concise form I append a small table of the various constituents compared with what I find already on the English Exchange.

COLOUR MARKS.

Numbers.								English Sample.	Maximum Price.	Maximum Marks.
1.	2.	3.	4.	5.	6.	7.	8.			
10	9	10	10	9	10	9	10	9	s. d. 34 3	10
STRENGTH.										
10	9	10	10	9	8	8	8	9	....	10
APPEARANCE.										
10	10	10	10	8	8	8	8	8	....	10
MILLING STRUCTURE.										
10	10	10	10	9	9	8	9	9	....	10

'In conclusion, I should just like to add that not nearly enough of the first quality reaches our principal markets. This may of course arise from the fact that most of it is milled in Canada. Our regular samples do not on the whole reach up to the maximum, but may be said to be a shade better than what I found when I mixed several together. It would also be to the general advantage if the grades were kept more distinct and a stricter line drawn between the best No. 1 sorts and No. 1 ordinary. The best is always welcome, will always fetch the highest price, while mixing of any kind whatsoever spoils them for one or other of the points I have just enumerated.

(Signed 'WILLIAM HALLIWELL.'

Mr. Halliwell says that samples Nos. 1 to 4, inclusive, that is Red Fife, Preston, Stanley and Percy, grown at Indian Head, are almost equal, 'There being a just perceptible difference, but not enough, I should say, to make a difference in the general selling price on our English markets.' The four samples of the same wheats grown at Ottawa he ranks somewhat lower in value, but says that their general excellence is much better than one would expect from their outside appearance alone. In no case, however, would the latter numbers be sold at the price of those numbered 1 to 4. He puts

these Ottawa grown samples in the following order of merit:—'6' Preston, '5' Percy, '8' Stanley, '7' Red Fife.

Further on in his report he seems to reach a slightly different conclusion and alters the relative position of these numbers, when he comes to speak of the price they would bring that day on the London market. He says: 'I have also compared the eight samples with others on the London Corn Exchange, May 21. I have been at the trouble to work them side by side in the examination, and I find that for strength (the ruling characteristic) Nos. "1," Percy, "3," Red Fife, and "4," Stanley, would sell at Mark Lane at 34s. 3d. per 496 pounds; No. "2," at 34s.; Nos. "5," Percy, and "7," Red Fife, at 33s. 9d., and Nos. "6," Preston, and "8," Stanley, at 33s. 6d.

The results of these tests and criticisms show that the two cross-bred wheats, Percy and Stanley from Indian Head are, in the opinion of Mr. Halliwell, in every respect equal to Red Fife, taking into account colour, strength, appearance and milling structure. The Preston stands equal to Red Fife in appearance and milling structure, but falls slightly below in point of strength. In the first part of his report Mr. Halliwell speaks of this as a 'just perceptible difference, not enough, I should say, to make a difference in the general selling price on our English markets.' But when dealing with the actual values of the samples on the London Corn Exchange, Percy, Stanley and Red Fife are given as being worth 34s. 3d. for 496 pounds, and Preston as worth 34s., which is equivalent to a difference in value of ⅗ of one cent per bushel.

Again, in his valuation of the samples grown at Ottawa, he puts the Percy and Red Fife first, instead of putting the Preston first, as in the early part of his report, placing these at 1½ cents a bushel less in value, and Preston and Stanley at 2¼ cents less per bushel in value than the same wheats grown in the North-west. These estimates of the relative value of these wheats in the London market, coming from so high an authority and a man of so much experience, are, no doubt in every way worthy of confidence. The differences, however, in actual value are less than one would suppose, judging from the relative prices of eastern and western wheats in this country.

ANALYSES OF WHEATS BY THE CHEMIST OF THE EXPERIMENTAL FARMS.

The analyses made of the eight wheats referred to, by Mr. F. T. Shutt, Chemist of the Dominion Experimental Farms, were reported on as follows:—

'CENTRAL EXPERIMENTAL FARM,
OTTAWA, May 2, 1903.

'Report on Wheats—Percy, Preston, Red Fife, and Stanley—Grown on the Experimental Farm, Indian Head, N.W.T., and the Central Experimental Farm, Ottawa, 1902.

Number.	Variety.	Locality Grown.	Weight per bushel.	Weight of 100 kernels.	Moisture.	Albuminoids.	Fat.	Crude Fibre.	Ash.	Carbo-hydrates.	Gluten.	
											Wet.	Dry.
			Lbs.	Grams.								
1	Percy	Indian Head.....	62	2·828	11·50	12·50	2·26	1·79	1·47	70·48	38·10	14·78
2	Preston.....	"	63½	3·022	11·48	11·63	2·25	1·85	1·68	71·11	31·68	12·34
3	Red Fife ...	"	62½	3·164	11·44	12·44	2·48	1·86	1·36	70·42	34·68	13·43
4	Stanley .. .	"	62½	3·019	11·08	12·41	2·42	1·88	1·44	70·77	37·48	14·18
5	Percy	Ottawa	62	3·551	12·05	13·56	2·14	2·09	1·91	68·25	41·59	16·64
6	Preston....	"	63	3·680	12·22	12·22	2·46	1·83	1·88	69·39	35·93	14·26
7	Red Fife ...	"	61	3·302	12·79	12·41	2·43	2·02	1·84	68·51	34·35	13·55
8	Stanley	"	62	3·551	12·23	12·34	2·44	2·08	1·71	69·20	33·95	14·22

'These wheats have been submitted to a careful chemical analysis, which include a determination of all the important constituents. The results are given in the ac companying table, which also presents certain data of a physical character, usuall taken into consideration in determining the relative values of wheats.

'In certain important features, well marked differences are to be observed betwee the wheats grown at Indian Head and Ottawa. These may be briefly alluded to a follows:—

'Moisture: Invariably, the Indian Head wheats have the smaller water-conten Their average is 11·37 per cent, while that of the Ottawa grown samples is 12·4 per cent.

'Albuminoids: As the analyses stand, two varieties—Percy and Preston—as grow at Ottawa, show a somewhat higher proportion of albuminoids than the same wheat grown at Indian Head; in the case of the other two, Red Fife and Stanley—the pe centages of this constituent, as obtained from the Ottawa grown samples, do no materially differ from those of Indian Head. The average obtained from the fou varieties at Indian Head is 12·24 per cent, and of the same wheats, grown at Ottawa, i 12·64 per cent.

'It has already been remarked that the Ottawa grown wheats contain the large percentage of moisture; it is, therefore, evident that calculated to a water-free basis they would all show a higher percentage of albuminoids than those from Indian Head

'Gluten—Wet and Dry: Though intimately allied to the albuminoids presen these results being obtained by mechanical means, do not furnish as accurate a guid to the nutritive values of the wheats as those obtained by chemical analysis. It is o interest and importance, however, to note that they follow closely the albuminoid con tent, and thus furnish corroborative data as to the greater value, both from the millin and nutritive standpoint, of the Ottawa grown wheats. The analyses are as follows:—

'Ottawa Samples: Wet gluten, 36·45 per cent; dry gluten, 14·67 per cent.

'Indian Head Samples: Wet gluten, 35·48 per cent; dry gluten, 13·68 per cent.

'The foregoing results as to albuminoids and gluten are not such as we should hav predicted. Our own investigations in the past have almost invariably indicated tha wheats grown in the North-west are richer in this respect than the same varietie grown in Ontario or the eastern provinces, and our results in this matter have receive corroboration from those of Professor Richardson, late of the Division of Chemistry Department of Agriculture, Washington, D.C., U.S., who some years ago made a ver thorough investigation into the character of wheats as grown in the several States o the Union, and who was successful in showing that environment—soil, climate, an cultivation—had a great effect upon the composition of wheats. Wheat, of all th cereals, is the most susceptible to the influences of environment, and consequently w may well suppose as a result of an unfavourable season a wheat decidedly inferior t that usually obtained in the locality. These considerations lead the writer to conclud that the present data are somewhat abnormal, and are not to be interpreted as indicat ing that the environment as at Ottawa is invariably more favourable to a high protein content than that of the North-west. The probability is that the seasonal or climati influences last autumn at Indian Head, and probably other parts of the North-west were not so favourable to the maturation of the grain as usual.†

'Oil or Fat: The data showing the percentage of this constituent do not call fo any special or detailed comment. The average for the Indian Head samples is 2·3 per cent; that for the Ottawa samples, 2·37 per cent.

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*In comparing these gluten data with those obtained by the miller, the former will invaria bly be found higher, since they have been obtained upon the whole wheat meal, and conse quently contain the elements of the bran and shorts absent in the flour.

† In discussing these conclusions with an experienced grain buyer and miller, I am informe that the wheat of last year's crop from certain districts of the North-west is somewhat inferio in quality to that usually produced, and that this may be attributed to a check in the ripen ing of the wheat, which occurred a few weeks before harvesting, due to low temperatures ; i some parts the freezing point was almost reached.

'Crude Fibre: This constituent practically represents the bran elements. The Ottawa grown wheats show a somewhat higher proportion, but the difference is slight. The averages are: Indian Head, 1·84 per cent; Ottawa, 2·01 per cent.

'Ash: As regards mineral matter, the Ottawa grown wheats show slightly higher percentages than those from Indian Head. The average for the former is 1·83 per cent; for the latter, 1·49 per cent. This may be an additional indication of the more complete ripeness of the Ottawa grown samples.

'In making a comparison between the varieties, judging of excellence chiefly from the albuminoids and gluten content, it is first to be noted that all these wheats are of the same general character, in many particulars almost identical, and would be designated as of first class quality. The amount and character of the gluten indicate clearly their high value for bread making purposes. There are, however, certain differences, and if placed in order of merit, Wheat No. 5, Percy, Ottawa, would stand first, with the same wheat grown at Indian Head (No. 1) a close second. Of the other three wheats, those grown at Indian Head, the order would probably be Red Fife and Stanley, equal, followed closely by Preston. In the Ottawa grown samples these three wheats show extremely small differences—the albuminoid data slighly favouring the Red Fife, while the dry gluten content similarly favour the Preston and Stanley.

(Sgd.) 'FRANK T. SHUTT,

'Chemist, Dominion Experimental Farms.'

FURTHER MILLING TESTS AND ANALYSES.

A second lot of samples was sent to Mr. Julicher, of Minneapolis, numbering six in all, two of White Fife, one of which was from Ottawa and one from Indian Head; one of Early Riga grown at Indian Head, this being the very early ripening wheat to which I have already referred, a cross of Onega with Gehun, another was a sample of Laurel from Ottawa, a cross between Red Fife and Gehun, and two samples of Goose wheat, one from Ottawa and one from Indian Head. The Laurel was sent because it had given an average yield of 33 pounds per acre in excess of Preston on a four years' test, and 2 bushels 16 pounds per acre more than Red Fife.

Mr. Julicher's report on this second lot of samples is as follows:—

MINNEAPOLIS, Minn., April 6, 1903.

—	Dough.		Gluten.			
	Quality.	Action in Washing.	Density.	Colour.	Quantity.	Quality.
					p.c.	
No. 9 (White Fife, Ottawa)	Creamy white.	Excellent.	Excellent.	White....	11·8	101
" 12 (White Fife, Indian Head) .	Creamy	Good....	Good.....	Creamy ..	11·1	100
" 14 (Early Riga, Ottawa)	Creamy white.	Excellent.	Excellent.	White....	14·2	101
" 11 (Laurel, Ottawa).....	Creamy white.	Good.....	Good.....	White....	11·1	100
" 10 (Goose, Ottawa)	Dark.........	Poor	Ductile...	Dark.....	11·4	90
" 13 (Goose, Indian Head)......	Dark yellow..	Poor	Ductile...	Yellow ...	12·8	95

The samples marked 9 (White Fife, Ottawa) and 14, (Early Riga) are of excellent quality; Nos. 11 (Laurel, Ottawa) and 12 (White Fife, Indian Head) are of good quality; but Nos. 10 (Goose, from Ottawa) and 13 (Goose from Indian Head) are of very poor quality for milling and bread making; of these two I would favour Nos. 13 (the Indian Head sample).

In this examination, Mr. Julicher puts the Early Riga in point of quality, higher than either of the samples of Red Fife, except that he makes the dough creamy white

instead of white. He says it is excellent in the dough, excellent in the density of the gluten, white in colour of gluten, 101 in quality of gluten, and 14·2 per cent in quantity. This gives it about 20 per cent more gluten than the sample of Red Fife from Indian Head. Here then we have a wheat which is eight and a half days earlier and higher in quality than Red Fife. It is possible that the season of 1902 may have been specially favourable to the Early Riga, but it is scarcely possible that any difference in season favourable to the production of a high proportion of gluten in the Early Riga would at the same time be unfavourable to the gluten content of Red Fife. This result as to the quality in Early Riga is most encouraging, and a gain of eight and a half days in ripening is of the greatest importance, as it may permit of the extension of the area for successful wheat growing a considerable distance northward.

A sample of the Early Riga wheat was also sent to Mr. F. T. Shutt, Chemist Dominion Experimental Farms, for analysis, on which he reports as follows:

'Central Experimental Farm,
'Ottawa, May 14, 1903.

'Report on Early Riga wheat, grown at Experimental Farm, Indian Head, N.W.T., 1902.

'*Analysis.*

Moisture	11·09
Albuminoids	13·72
Fat	2·13
Crude fibre	1·90
Ash	1·40
Carbo-hydrates	69·76
	100·00

'*Physical Data.*

Weight per bushel	64 lbs.
Weight of 100 kernels	2·438 grams.
Wet gluten	44·07
Dry gluten	16·70

'Comparing these results with those of the eight samples reported on May 2, 1903, it will be noted:

'1. That as regards moisture-content this wheat is very similar to those from Indian Head already examined. Their average was 11·37 per cent as against 11·09 per cent in the present instance.

'2. That in albuminoids this wheat is slightly superior to the best of the series previously reported on, viz., the Percy. The figures are as follows:—

Early Riga (N.W.T.)	13·72
Percy (Ottawa)	13·56
Percy (N.W.T.)	12·50

'As might be expected, the data for the wet and dry gluten are similarly higher than those of the Percy.

	Wet Gluten.	Dry Gluten.
Early Riga (N.W.T.)	44·07	16·70
Percy (Ottawa)	41·59	16·64
Percy (N.W.T.)	38·10	14·78

'Not only is the gluten satisfactory as to quantity, but also as to quality. In noting the character of the wet gluten, it was found to be slightly creamy in colour, firm, elastic, and of uniform texture—denoting a 'strong' flour and one eminently suitable for bread making purposes.

'FRANK T. SHUTT,
'Chemist, Dominion Experimental Farms.'

Mr. Shutt does not find in the chemical analysis quite as large a difference in the proportion of gluten in the Early Riga, when compared with the Percy, as Mr. Julicher gives, but the difference is only a fraction of one per cent. It should be noticed here that Mr. Shutt in each instance has analysed the whole wheat finely ground whereas Mr. Julicher's examinations were of the flour only.

DEDUCTIONS FROM ANALYSES OF WHEATS.

From the facts submitted, it seems clear that the eight samples first sent to these experts, of Red Fife, Preston, Percy and Stanley, whether grown at Indian Head or Ottawa, are all good wheats for milling and for bread. Mr. Julicher puts the two Red Fife samples first, very closely followed by Stanley, which is a twin wheat with Preston, and contains a higher percentage of gluten than either of the Red Fife samples. Preston stands equal to Red Fife in proportion of gluten, but drops below it a little in point of colour of the dough, the Ottawa sample of Preston standing a little higher in that respect than that from Indian Head in Mr. Julicher's report.

From the chemical analyses of these samples, Mr. Shutt puts Percy first in point of merit. It is shown to be richest in gluten, which accords also with Mr. Julicher's statement, whilst Mr. Halliwell puts it as just equal with Red Fife. Between Preston and Red Fife, while the Red Fife is graded as higher in quality, the difference is small and the advantage the Preston has of ripening on a average fully four days earlier may possibly make up for any slight difference in the grade. Its earlier ripening habit is a great inducement to the farmer to put this variety in as part of his crop, provided he can get about the same price for it. A difference of two-thirds of a cent per bushel, the actual difference in value on the English market, according to Mr. Halliwell, would not weigh with the farmer to any appreciable extent.

If a settler has a large acreage of wheat and has only limited help he must begin cutting part of the crop before it is quite ready or his wheat will shell badly before he reaches the end of his harvesting. The part of the crop which is cut first will shrivel more or less, which involves a loss in weight and sometimes in grade, to which must be added such loss as may arise from shelling. If by having a portion of the crop of an earlier sort, these difficulties can be overcome and there will be a large gain in the quality and character of the wheat grown.

With reference to the high quality and early maturing habit of the Early Riga wheat, the information presented is most encouraging. If this wheat on further trial maintains its earliness, quality and productiveness, its general introduction may largely influence the future of wheat-growing in Canada. The outlook is most encouraging, and the result a triumph of the skill of the hybridizer.

The few varieties here referred to constitute only a small proportion of the new sorts which have been produced. There are on hand many others of more or less promise which have been several years under trial. These with a considerable number of varieties of more recent production demand more care and attention than it has been possible for the Director to give them.

In view of the great importance of this branch of the work at the experimental farms, and to provide for its continuance in a larger way, the Minister of Agriculture

has authorized the formation of a special division of cereal breeding and experimentation, in charge of an officer known as the experimentalist, who will devote his whole time to it. The first report of the experimentalist will be found in this Annual Report of the Experimental Farms.

SPECIAL EXPERIMENTS WITH FERTILIZERS.

In the annual report of the experimental farms for 1893, details were given on pages 8 to 24 of the results of a series of tests which were carried on during the previous five or six years with the object of gaining information regarding the effects which follow the application of certain fertilizers and combinations of fertilizers on the more important farm crops. The particulars there given covered the results of six years' experience with crops of wheat and Indian corn, and five years' experience with crops of oats, barley, turnips and mangels. The results of similar tests conducted for three years with carrots and one year with sugar beets were also given.

These experiments have been continued, and a summary of the results obtained has been given each year, taking the average yield of crops from the beginning, adding the results for the current year, and then giving the average yield for the full time. These tests were undertaken on virgin soil, on a piece of land which was cleared for the purpose. For particulars regarding the clearing and preparing of the land for crop in 1887-88 and its subsequent treatment the reader is referred to the earlier issues of this report.

OBJECT IN VIEW IN CONDUCTING THESE EXPERIMENTS.

In establishing and conducting this series of experiments, the object in view has been to gain information as to the effects produced by certain fertilizers and combinations of fertilizers on particular crops. They were never intended to serve as model test plots such as farmers could copy with advantage in their general practice. On the contrary, to gain the information desired, it has been found necessary to use some fertilizers in unusual quantities, and in other instances to more or less exhaust the soil by a succession of crops of the same sort, practices which in ordinary farming would be extravagant or detrimental. From this long conducted series of tests much useful information has been gained, which appeals to the mind with greater force as experience accumulates from year to year.

VALUABLE INFORMATION GAINED.

These trials have shown that barn-yard manure can be most economically used in the fresh or unrotted condition; that fresh manure is equal, ton for ton, in crop-producing power to rotted manure, which, other experiments have shown, loses during the process of rotting about 60 per cent of its weight. In view of the vast importance of making the best possible use of barn-yard manure, it is difficult to estimate the value of this one item of information.

When these experiments were planned, the opinion was very generally held that untreated mineral phosphate, if very finely ground, was a valuable fertilizer, which gradually gave up its phosphoric acid for the promotion of plant growth. Ten years' experience has shown that mineral phosphate, untreated, is of no value as a fertilizer.

The use of sulphate of iron, which at the time these tests were begun, was highly recommended, as a means of producing increased crops, has also been proven to be almost useless for this purpose.

Common salt, which has long had a reputation with many farmers for its value as a fertilizer for barley, while others disbelieved in its efficacy, has been shown to be a most valuable agent for producing an increased crop of that grain, while it is of much less use when applied to crops of spring wheat or oats. Land plaster or gypsum has also proven to be of some value as a fertilizer for barley, while of very little service for

wheat or oats. Some light has also been thrown on the relative usefulness of single and combined fertilizers.

CHANGES MADE IN THE EXPERIMENTS.

After ten years' experience had demonstrated that finely-ground, untreated mineral phosphate was of no value as a fertilizer, its use was discontinued in 1898. Prior to this it had been used in each set of plots in Nos. 4, 5, 6, 7 and 8, in all the different series of plots, excepting roots. In 1898 and 1899, similar weights of the Thomas' phosphate were used in place of the mineral phosphate, excepting in plot 6 in each series. In this plot the Thomas' phosphate was used in 1898 only.

After constant cropping for ten or eleven years, it was found that the soil on those plots to which no barn-yard manure had been applied was much depleted of humus, and hence its power of holding moisture had been lessened, and the conditions for plant growth, apart from the question of plant food, had on this account become less favourable. In 1899 the experiments were modified and an effort made to restore some proportion of the humus and at the same time gain further information as to the value of clover as a collector of plant food. In the spring of that year ten pounds of red clover seed per acre was sown with the grain on all the plots of wheat, barley and oats. The clover seed germinated well, and after the grain was cut the young clover plants made rapid growth, and by the middle of October there was a thick mat of foliage varying in height and density on the different plots, which was ploughed under. The growing of carrots and potatoes on one-half of the cereal plots has been discontinued since 1898, and each plot of the wheat, barley and oats has occupied the full tenth of an acre.

In 1900, 1901, 1902 and 1903 clover was again sown on all the grain plots, and was ploughed under in October. In 1900 and 1901 a good growth of clover was obtained, but in 1902 a severe frost in the spring destroyed a large proportion of the young plants so that the crop available for ploughing under in the autumn was very light. In 1903 the crop of clover ploughed under in the autumn was fairly good.

APPLICATION OF FERTILIZERS DISCONTINUED.

Another direction in which information was sought was in reference to the length of time which a liberal application of barn-yard manure would continue to affect subsequent crops, and in 1899 on plots 1, 2 and 6 the barn-yard manure, which had been used for ten or eleven years in succession, was discontinued. The phosphate fertilizer was also omitted on plot 6 in each series.

In 1900 all the fertilizers on all the plots were discontinued, and since then the same crops have been grown on all these plots from year to year without fertilizers, sowing clover with the grain each season. In this way some information has been gained as to the value of clover as a collector of plant food, and also as to the unexhausted values of the different fertilizers which have been used on these plots since the experiments were begun.

SPECIAL TREATMENT OF PLOTS OF INDIAN CORN AND ROOTS.

As it was not practicable to sow clover with the Indian corn and root crops, the sowing of these latter crops was discontinued in the spring of 1900 and clover sown in their place in the proportion of 12 pounds per acre. The clover on these plots made strong growth, so strong as to necessitate twice cutting during the season, the cut clover being left on the ground in each case to decay and add to the fertility of the soil. The clover was left over for further growth in the spring of 1901, and ploughed under for the roots about May 10, and for corn about the middle of that month. Then roots and Indian corn were again sown. In 1902 crops of Indian corn and roots were grown on these plots, but in 1903 the land was again devoted to clover.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of $1\frac{1}{2}$ bushels per acre, excepting in 1894; and the varieties used were as follows:—In 1888-89-90 and 1891, White Russian, and in 1892-3, Campbell's White Chaff. In 1894, the Rio Grande wheat was used, when, owing to lack of germinating power in the seed, a larger quantity was required. From 1895 to 1903 inclusive Red Fife wheat was used in the usual quantity of $1\frac{1}{2}$ bushels per acre. In 1903, the Red Fife was sown April 22, and was ripe August 20.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT $\frac{1}{10}$TH ACRE EACH.

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fifteen Years.			16th Season, 1903, Variety Red Fife.			Average Yield for Sixteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure has been applied since then........	22	$22\frac{10}{15}$	4,053	22	40	3,550	22	$23\frac{12}{16}$	4,022
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure has been applied since then..........	22	$44\frac{9}{15}$	4,083	21	10	3,600	22	$38\frac{11}{16}$	4,053
3	Unmanured from the beginning...........	11	26	1,957	14	30	2,300	11	$37\frac{8}{16}$	1,978
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' Phosphate was used. No fertilizers have been applied since then........................	11	51	2,094	15	20	2,300	12	$4\frac{1}{16}$	2,107
5	Mineral phosphate, untreated, finely ground, 500 lbs. nitrate of soda, 200 lbs. per acre used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then........................	12	43	2,824	16	50	2,000	12	$58\frac{7}{16}$	2,773
6	Barn-yard manure, partly rotted and actively fermenting, six tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897 inclusive. In 1898, 500 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.	19	$28\frac{3}{15}$	3,354	17	50	2,755	19	$22\frac{6}{16}$	3,317
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then........................	13	$20\frac{1}{15}$	2,336	18	10	2,170	13	$38\frac{3}{16}$	2,607

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT $\frac{1}{10}$TH ACRE EACH—*Concluded.*

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fifteen Years.			16th Season, 1903. Variety, Red Fife.			Average Yield for Sixteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
8	Mineral phosphate, untreated, finely ground, 500 lbs. wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.....	11	$23\frac{3}{15}$	2,195	14	25	2,560	11	$34\frac{9}{16}$	2,218
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..............................	12	$13\frac{13}{15}$	1,965	14	35	2,305	12	$22\frac{11}{16}$	1,986
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	13	$8\frac{10}{15}$	2,951	15	15	2,985	13	$27\frac{4}{16}$	2,953
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. No fertilizers have been applied since then......	14	25	2,909	14	20	2,765	14	$24\frac{11}{16}$	2,900
12	Unmanured from the beginning...........	10	$25\frac{5}{15}$	1,940	12	10	1,985	10	$31\frac{14}{16}$	1,943
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	12	$33\frac{3}{15}$	2,056	14	55	2,805	12	$42\frac{1}{16}$	2,103
14	Bone, finely ground, 500 lbs.; wood ashes unleached, 1,500 lbs. per acre; used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	15	20	2,648	17	10	3,180	15	$26\frac{14}{16}$	2,681
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	14	1	2,462	17	45	3,010	14	15	2,496
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	15	$44\frac{8}{15}$	2,240	15	35	2,925	15	$43\frac{15}{16}$	2,282
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	12	$57\frac{2}{15}$	2,403	14	10	2,870	13	$1\frac{1}{16}$	2,432
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	12	$51\frac{5}{15}$	2,007	12	45	2,207	12	$50\frac{15}{16}$	2,019
19	Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..............................	13	$51\frac{4}{15}$	1,640	12	50	2,069	13	$47\frac{7}{16}$	1,667
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then...	12	$50\frac{8}{15}$	1,977	13	45	2,173	12	$53\frac{14}{16}$	1,989
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been used since then	13	$10\frac{9}{15}$	1,969	14	45	2,208	13	$16\frac{8}{16}$	1,934

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was 2 bushels in 1889, 1890 and 1891, $1\frac{1}{2}$ bushels in 1892 and 1893, and 2 bushels from 1894 to 1903, inclusive. Two-rowed barley has been used for seed throughout until 1902, when Mensury, a six-rowed sort was tried. The varieties used were as follows: 1889, 1890 and 1891, Saale; 1892, Goldthorpe; 1893, Duck-bill; and in 1894, 1895, 1896, 1897, 1898, 1899, 1900 and 1901, Canadian Thorpe, a selected form of the Duck-bill. In 1902 and 1903 Mensury was sown. In 1903 it was sown April 22, and was harvested on July 28.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY, $\frac{1}{10}$TH ACRE EACH.

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fourteen Years. Yield of Grain. Per acre. Bush.	lbs.	Average Yield for Fourteen Years. Yield of Straw. Per acre. Lbs.	15th Season, 1903. Variety, Mensury. Yield of Grain. Per acre. Bush.	lbs.	15th Season, 1903. Variety, Mensury. Yield of Straw. Per acre. Lbs.	Average Yield for Fifteen Years. Yield of Grain. Per acre. Bush.	lbs.	Average Yield for Fifteen Years. Yield of Straw. Per acre. Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year to 1898, inclusive. No manure has been applied since then......	35	$5\frac{2}{14}$	3,086	41	22	2,695	35	$25\frac{7}{15}$	3,060
2	Barn-yard manure, fresh, 15 tons per acre, each year to 1898, inclusive. No manure has been applied since then............	35	$8\frac{7}{14}$	3,253	37	9	2,975	35	$14\frac{14}{15}$	3,234
3	Unmanured from the beginning...........	13	$43\frac{7}{14}$	1,543	23	36	1,454	14	$28\frac{13}{15}$	1,537
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used, no fertilizers have been applied since then........................	15	$12\frac{10}{14}$	1,505	25	10	1,579	15	$44\frac{8}{15}$	1,510
5	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then............	20	$47\frac{4}{14}$	2,220	24	18	2,214	21	$10\frac{2}{15}$	2,219
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then	28	$15\frac{11}{14}$	2,403	31	37	2,293	28	$26\frac{2}{15}$	2,396
7	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then	25	$46\frac{4}{14}$	2,380	30	25	2,335	26	$12\frac{13}{15}$	2,377

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY $\frac{1}{10}$ ACRE EACH—*Concluded.*

No. of plot.	Fertilizers applied each year, from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fourteen Years.			15th Season, 1903, Variety, Mensury.			Average Yield for Fifteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
8	Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then............	21	$3\frac{1}{14}$	1,821	31	32	2,032	21	37	1,835
9	Mineral superphosphate, No. 1, 500 lbs. per acre used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then....	21	$8\frac{11}{14}$	1,757	26	32	1,333	21	$26\frac{5}{15}$	1,729
10	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then........	28	$3\frac{2}{14}$	2,369	28	16	2,219	28	4	2,359
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	26	$39\frac{12}{14}$	2,488	29	38	2,377	27	$1\frac{5}{15}$	2,481
12	Unmanured from the beginning...........	13	$32\frac{1}{14}$	1,224	22	24	1,290	14	$12\frac{5}{15}$	1,228
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	14	$34\frac{11}{14}$	1,415	23	26	1,505	15	15	1,421
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	23	$41\frac{10}{14}$	2,074	26	12	2,292	24	$1\frac{5}{15}$	2,089
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	22	$10\frac{6}{14}$	2,284	21	17	2,084	22	$7\frac{10}{15}$	2,270
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	22	$41\frac{2}{14}$	1,861	22	34	1,825	22	$40\frac{10}{15}$	1,859
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	19	$15\frac{12}{14}$	1,943	20	25	1,792	19	$16\frac{7}{15}$	1,933
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	18	36	1,673	21	22	1,419	18	$44\frac{10}{15}$	1,656
19	Common salt (sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then...........................	27	$36\frac{7}{14}$	1,895	22	14	1,849	27	19	1,892
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.....................	20	$14\frac{9}{14}$	1,605	23	11	1,391	20	24	1,591
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..........................	20	$46\frac{11}{14}$	1,783	24	23	1,592	21	$9\frac{9}{15}$	1,770

OAT PLOTS.

The quantity of seed sown per acre on the oat plots, was 2 bushels in 1889 and 1890; 1½ bushels in 1891, 1892 and 1893, and 2 bushels from 1894 to 1903, inclusive. The varieties used were as follows: In 1889, Early English; in 1890, 1891, 1892, 1893, Prize Cluster; and from 1894 to 1903, inclusive, the Banner. In 1903 the Banner was sown April 22 and the plots were harvested August 17.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS, $\frac{1}{10}$ ACRE EACH.

Number of Plot.	Fertilizers applied each year, from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fourteen Years.		15th Season, 1903. Variety, Banner.		Average Yield for Fifteen Years.	
		Yield of Grain. Per acre.	Yield of Straw. Per acre	Yield of Grain. Per acre.	Yield of Straw. Per acre	Yield of Grain. Per acre.	Yield of Straw. Per acre
		Bush. lbs.	Lbs.	Bush. lbs.	Lbs.	Bush. lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year, to 1898, inclusive. No manure has been applied since then.....	51 $13\frac{2}{14}$	3,241	50 25	3,015	51 $11\frac{10}{15}$	3,226
2	Barn-yard manure, fresh, 15 tons per acre each year to 1898, inclusive. No manure has been applied since then............	55 $22\frac{7}{14}$	3,422	53 13	2,605	55 $17\frac{5}{15}$	3,368
3	Unmanured from the beginning...........	34 $5\frac{1}{14}$	1,689	37 2	2,076	34 $11\frac{10}{15}$	1,715
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizers have been applied since then......................	34 $7\frac{2}{14}$	1,832	42 32	2,008	34 $26\frac{14}{15}$	1,844
5	Mineral phosphate, untreated, finely ground, 500 lbs. nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.	49 $13\frac{10}{14}$	2,667	39 14	2,580	48 $25\frac{1}{15}$	2,661
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898, 500 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then..	48 $15\frac{7}{14}$	2,720	43 33	2,984	48 $5\frac{5}{15}$	2,738
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then......................	49 $7\frac{11}{14}$	3,152	47 27	3,010	49 $4\frac{8}{15}$	3,143
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then............	43 $4\frac{11}{14}$	2,469	50 30	2,899	43 $22\frac{5}{15}$	2,498
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been used since then...........................	37 $16\frac{9}{14}$	1,972	47 22	2,038	38 $5\frac{10}{15}$	1,976

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS $\frac{1}{10}$ ACRE EACH—*Continued.*

No. of Plot.	Fertilizers applied each year, from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the autumn.	Average Yield for Fourteen Years.		15th Season, 1903. Variety Banner.		Average Yield for Fifteen Years.	
		Yield of Grain.	Yield of Straw.	Yield of Grain.	Yield of Straw.	Yield of Grain.	Yield of Straw.
		Per acre.	Per acre	Per acre.	Per acre	Per acre.	Per acre
		Bush. lbs.	Lbs.	Bush. lbs.	Lbs.	Bush. lbs.	Lbs.
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	47 $17\frac{10}{14}$	2,693	38 28	2,505	46 32	2,680
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre used each year from 1888 to 1897, inclusive. No fertilizers have been applied since then.......	38 $29\frac{8}{14}$	2,416	40 30	2,581	39 $\frac{3}{15}$	2,427
12	Unmanured from the beginning...........	23 $4\frac{6}{14}$	1,398	33 23	1,820	23 $28\frac{5}{15}$	1,426
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	34 $26\frac{7}{14}$	2,035	35 20	1,850	34 $28\frac{5}{15}$	2,023
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then...	41 $10\frac{4}{14}$	2,273	45 —	2,630	41 $18\frac{10}{15}$	2,297
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	47 $22\frac{5}{14}$	2,759	40 15	2,560	47 6	2,746
16	Muriate of potash, 150 lbs. per acre, used each year from 1898 to 1899 inclusive. No fertilizers have been applied since then...	38 $26\frac{3}{14}$	2,207	44 24	2,375	39 $5\frac{10}{15}$	2,218
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	45 $11\frac{11}{14}$	2,820	46 1	2,425	45 $13\frac{5}{15}$	2,794
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then...	38 $13\frac{1}{14}$	2,018	47 32	1,525	39 —$\frac{11}{15}$	1,935
19	Common salt (Sodium chloride) 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then............................	37 $25\frac{3}{14}$	1,956	49 4	1,545	38 15	1,929
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then...........	34 $25\frac{6}{14}$	1,959	37 22	2,070	34 32	1,966
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizers have been applied since then	35 19	1,860	34 24	1.854	35 17	1,859

INFLUENCE OF CLOVER, PLOUGHED UNDER, ON FARM CROPS.

The ploughing under of clover has been found most effective as an additional source of fertility. It increases the store of available plant food by the addition of nitrogen obtained directly from the atmosphere. It adds also to the mineral plant food available, potash and phosphoric acid by gathering these from depths not reached by the shallower root systems of other farm crops. It also serves as a catch crop during the autumn months, retaining fertilizing material brought down by the rain, much of which would otherwise be lost. Further it supplies the soil with a large addition of humus whereby it is made more retentive of moisture, and results in a deepening and mellowing of the soil. Humus also furnishes material in which those minute forms of germ life which act so beneficially on the soil can thrive and propagate freely.

Marked benefits have been observed from the use of clover on all the plots referred to. A few examples may be cited, taken from all the series.

On plot 7, of the oat series, 500 pounds of fine ground mineral phosphate untreated was used per acre for nine years, and during the two following years 500 pounds of the Thomas phosphate, in place of the untreated mineral phosphate. There was also used on these plots yearly for 11 years, 200 pounds of nitrate of soda and 1,000 pounds of unleached wood ashes per acre. With this large annual application of artificial fertilizers the crop of oats had averaged for ten years 44 bushels 30 pounds per acre. With the discontinuance of the fertilizers and the use of clover the crop in bushels and pounds per acre for the five succeeding years was 58·18; 65·15; 56·31; 57·27, and 47·27. These figures show an average increase in the crop of oats for the five years of 12 bushels 14 pounds per acre, or more than 25 per cent.

On plot 11 in the oat series there were used annually for ten years 350 pounds of mineral superphosphate, 200 pounds of nitrate of soda and 1,500 pounds of unleached wood ashes. The crop during this period gave an average of 36 bushels 5 pounds per acre. With the discontinuance of the fertilizers and the use of clover, the crops for the past five years in bushels and pounds per acre were 37·2; 45·20; 49·29; 51·6, and 40·30, an average increase in crop of 8 bushels 26 pounds, or more than 22 per cent.

On plot 14 in this series fine ground bone was used annually in the proportion of 500 pounds per acre, with 1,500 pounds of unleached wood ashes. At the end of ten years the crop of oats had averaged 37 bushels 6 pounds per acre. With the discontinuance of the bone and ashes and the use of clover the crops for the five succeeding years in bushels and pounds per acre have been as follows: 42·27; 62·2; 49·14; 50·25, and 45, an average increase in crop for the five years of 12 bushels 28 pounds per acre, or more than 30 per cent.

On plot 3 in this series, oats had been grown for ten years in succession without the application of any fertilizer whatever. The crops for the ten years had averaged 30 bushels 23 pounds per acre. With the subsequent use of clover they have stood for the past five years as follows: 29 bushels 2 pounds; 47·2; 48·3; 46·11, and 37·2, an average increase for the five years, of 10 bushels 28 pounds, more than 31 per cent. This is an astonishing increase in view of the fact that oats had been grown every year on the same land for the whole period, and that during the five years when this increase occurred clover was the only fertilizing agent used.

Taking the same series of plots in wheat, which have received the same fertilizers in the same quantities, but for eleven years instead of ten, we find :

On plot 7 of the wheat series the crop for eleven years under the annual fertilizing mentioned under oats averaged 12 bushels 43 pounds per acre. With the discontinuance of the fertilizers and the annual use of clover the crops for the five succeeding years were 12 bushels 50 pounds; 13·20; 16·50; 17·5, and 18·10, an average increase for the five years, of 2 bushels 56 pounds per acre, more than 23 per cent.

In plot 11 in the wheat series the average crop for the eleven years during which the fertilizers were applied was 13 bushels 31 pounds. With the discontinuance of the fertilizers and the annual use of clover the crops for the five succeeding years were 18·30; 18·20; 16·5; 14·40, and 14 bushels 20 pounds per acre, an average increase for the five years of 2 bushels 52 pounds per acre equal to 22 per cent.

On plot 14 the influence of the clover is not so marked, the increase being a little over 10 per cent.

On plot 3, on which wheat was grown for 11 years without the use of any fertilizer the crops during this period averaged 10 bushels, 16 pounds per acre. With the subsequent use of clover they have stood for the past five years as follows: 10·35; 13·45 17·20; 16·50, and 14 bushels 30 pounds, an average increase for the five years of 4 bushels 20 pounds per acre, more than 40 per cent.

On plot 7 of the barley series the crop for ten years averaged 22 bushels 26 pounds per acre, with the discontinuance of the fertilizers and the annual use of clover the

crops for the five succeeding years were 35·15; 32·2; 27·24; 42·34, and 30 bushels 25 pounds, an average increase for the five years of 11 bushels 3 pounds per acre, equal to more than 48 per cent.

On plot 11 of the barley series the increase in crop from clover has been less. During the ten years when the fertilizers were used the crop averaged 25 bushels 33 pounds. With the discontinuance of the fertilizers and the annual use of clover the crops for the five years following were 30·45; 26·32; 19·8; 41·42, and 29 bushels 38 pounds per acre, an average increase for the five years of 4 bushels per acre, somewhat over 15 per cent.

On plot 14 during the ten years when the fertilizers were used the crop of barley averaged 22 bush. 1 lb. per acre. With the discontinuance of the fertilizers and the annual use of clover the crops for the five years following were 26·2; 25·35; 21·2; 41·2, and 26 bush. 12 lbs. per acre, an average increase for the five years of 6 bushels per acre, more than 25 per cent.

On plot 3 on which barley was grown for 10 years without use of any fertilizer, the crop during this period averaged 13 bush. 32 lbs., but the crop on the tenth year was reduced to 8 bush. 6 lbs. per acre. With the subsequent use of clover the crops have stood for the past five years as follows: 10·40; 9·33; 10·15; 27·4; and 23 bush. 36 lbs. per acre, an average increase for the five years of 2 bush. 32 lbs. per acre, nearly 20 per cent.

The results were still more marked with Indian corn. This crop on plot 3, after 10 years' test, was reduced to about 2 tons per acre. With one crop of clover, turned under, the yield of Indian corn was increased to over 8 tons per acre. On plot 11 the average of 10 years was 13 tons 1,090 pounds per acre. The ploughing under of a single crop of clover raised this the following season to 26 tons 505 pounds per acre.

On field roots, the beneficial action of clover ploughed under was also very striking. The turnips grown on plot 3 with no fertilizer for the 10 years ending with 1899, averaged 6 tons 1,863 pounds per acre, with one crop of clover ploughed under the average for the two years following was 10 tons 1,560 pounds, an average increase of 3 tons 1,697 pounds per acre; more than 50 per cent.

The mangels on plot 3 had given an average to 1899, of 8 tons 1,587 pounds. The two years following the turning under of clover the crop averaged 10 tons 1,560 pounds, an increase of 2 tons per acre, or nearly 25 per cent.

Many similar instances could be given, but enough has perhaps been presented to establish the fact that the ploughing under of clover gives a large increase to the crop which follows, and in addition to the fertilizing material contributed by the clover the humus thus added to the soil conserves moisture and enables the rootlets of the growing plants to utilize a larger proportion of the plant food which the soil contains.

INCREASED CROPS FROM THE PLOUGHING UNDER OF CLOVER.

The following tests were planned in 1900 when sufficient plots were sown with grain, on one-half of which clover was sown at the same time, in the proportion of 12 pounds of seed per acre, leaving alternate plots on which no clover was sown.

GROUP NO. 1, DIVISION 1.

On this series of six plots, side by side Banner oats were sown in 1901, Everett potatoes in 1902 and Selected Leaming corn in 1903. The following table shows the

increased crops, resulting from one crop of clover, the first, second and third years after ploughing under.

Results obtained from alternate plots with and without clover.	1901. Banner Oats. Yield of Grain per acre.		1901. Banner Oats. Weight of Straw per acre.	1902. Everett Potatoes. Yield per acre.		1903. Selected Leaming Corn. Yield per acre.	
	Bush.	lbs.	Lbs.	Bush.	lbs.	Tons.	lbs.
1 Crops in 1901-2-3 after clover in 1900................	49	14	3,440	293	20	13	1,760
2 " 1901-2-3 on plot where no clover was grown...	47	2	2,480	274	40	12	800
Gain from use of clover.............	2	12	960	18	40	1	960
3 Crops in 1901-2-3 after clover in 1900................	42	12	2,640	272	..	10	960
4 " 1901-2-3 on plot where no clover was grown..	37	22	1,920	270	40	9	1,040
Gain from use of clover........	4	24	720	1	20	..	1,920
5 Crops in 1901-2-3 after clover in 1900.........	40	..	3,040	353	20	12	1,440
6 " 1901-2-3 on plot where no clover was grown..	35	10	2,240	333	20	10	800
Gain from use of clover.............	4	24	800	20	..	2	640

In Division 1, the three plots of Banner oats after clover, show for the first year an average gain per acre from the use of clover of 3 bush. 31 lbs. of grain and 827 lbs. of straw. The same plots in potatoes the second year show an average gain of 13 bush. 20 lbs., and the same plots planted with Indian corn the third year an average gain from the use of clover of 1 ton 1,173 lbs. per acre.

DIVISION NO. 2.

In this series of six plots, side by side, Everett potatoes were sown in 1901, Selected Leaming corn in 1902, and Banner oats in 1903, and the following results obtained:—

Results obtained from alternate plots, with and without clover.	1901. Everett Potatoes. Yield per acre.		1902. Selected Leaming Corn. Yield per acre.		1903. Banner Oats. Yield of Grain per acre.		1903. Banner Oats. Weight of Straw per acre.
	Bush.	lbs.	Tons.	lbs.	Bush.	lbs.	Lbs.
7 Crops in 1901-2-3 after clover in 1900	440	..	19	..	62	12	3,200
8 " 1901-2-3 on plot where no clover was grown.	396	40	16	1,600	50	20	3,080
Gain from use of clover.............	3	20	2	400	11	26	120
9 Crops in 1901-2-3 after clover in 1900....	420	..	16	640	60	..	4,200
10 " 1901-2-3 on plot where no clover was grown.	396	..	15	880	54	4	2,160
Gain from use of clover.............	24	..	..	1,760	5	30	2,040
11 Crops in 1901-2-3 after clover in 1900................	411	20	20	200	65	30	4,200
12 " 1901-2-3 on plot where no clover was grown.	381	20	16	1,600	44	24	2,800
Gain from use of clover.............	30	..	3	600	21	6	1,400

In Division No. 2 the three plots of Everett potatoes after clover show, for the first year, an average gain per acre from the use of clover of 19 bushels 7 lbs. The same plots in Indian corn the second year show an average gain of 2 tons 253 lbs and the

ame plots sown the third year with Banner oats show an average gain from the use f clover of 12 bush. 32 lbs. of grain and 1,187 lbs. of straw.

GROUP NO. 2.

In each of the three divisions in this group there were three plots. In the upper ne in each table the crops were sown after clover ploughed under in the autumn of 900, and in the lower one clover was also sown in the spring of 1900 and allowed to row for two seasons and was ploughed under in the autumn of 1901. On the middle lot no clover was grown. It will be seen that considerable gains were made by the se of clover in both cases.

Division No. 1.	1901. Corn, Selected Leaming. — Yield per Acre.		1902. Banner Oats. Yield of Oats per Acre.		1902. Banner Oats. Weight of Straw per Acre	1903. Potatoes, Everett. — Yield per Acre.	
	Tons.	Lbs.	Bus.	Lbs.	Lbs.	Bus.	Lbs.
1 Crops in 1901-2-3, after clover in 1900	25	1,600	70	20	3,840	195	20
2 Crops in 1901-2-3, on plot where no clover was grown in 1900	20	160	58	28	3,120	175	20
Gain from use of clover	5	1,440	11	26	720	20	00
3 Crops in 1902-3, on plot where clover was allowed to grow two seasons	....		65	30	4,400	221	20
Gain from use of clover	....		7	2	1,280	45	40

Division No 2.	1901. Corn, Selected Leaming. — Yield per Acre.		1902. Banner Oats. Yield of Oats Per Acre.		1902. Banner Oats. Weight of Straw per Acre	1903. Carrots. — Yield per Acre.	
	Tons.	Lbs.	Bus.	Lbs.	Lbs.	Tons.	Lbs.
4 Crops in 1901-2-3, after clover in 1900	27	880	70	20	3,920	31	960
5 Crops in 1901-2-3, on plots where no clover was grown in 1900	15	1,600	47	2	2,000	20	640
Gain from use of clover	11	1,280	23	18	1,920	11	320
6 Crops in 1902-3, on plot where clover was allowed to grow two seasons	....		72	32	3,760	21	600
Gain from use of clover	....		25	30	1,760		1,960

Division No. 3.	1901. Corn, Selected Leaming. — Yield per Acre.		1902. Banner Oats. Yield of Oats per Acre.		1902. Banner Oats. Weight of Straw per Acre	1903. Sugar Beets. — Yield per Acre.	
	Tons.	Lbs.	Bus.	Lbs.	Lbs.	Tons.	Lbs.
7 Crops in 1901-2-3, after clover in 1900	27	1,760	75	10	4,160	22	600
8 Crops in 1901-2-3, on plot where no clover was grown in 1900	19	1,280	51	26	2,320	8	1,200
Gain from use of clover	8	480	23	18	1,840	13	1,400
9 Crops in 1902-3, on plot, where clover was allowed to grow two seasons	....		68	8	4,080	*	
Gain from use of clover	....		16	16	1,760		

* Did not germinate.

Group No. 3.

Division 1.	1902. Banner Oats. Yield of Oats Per Acre.		1902. Banner Oats. Weight of Straw Per Acre.	1903. Turnips. Yield Per Acre.	
	Bush.	Lbs.	Lbs.	Tons.	Lbs
1 Crops in 1902-3, after clover in 1901	70	20	4,720	25	
2 Crops in 1902-3, on plot where no clover was grown in 1901	58	28	3,120	20	1,92
Gain from use of clover	11	26	1,600	4	8

Division 2.	1902. Potatoes Everett. Yield Per Acre.		1903. Carrots. Yield Per Acre.		1902. Corn, Selected Leaming. Yield Per Acre.		1903. Potatoes Everett. Yield Per Acre.	
	Bush.	Lbs.	Tons.	Lbs.				
3 Crops in 1902-3, after clover in 1901	392	40	20	1,400	.....	......		
4 Crops in 1902-3, on plot where no clover was grown in 1901	358		18	280	.....	......		
Gain from use of clover	34	40	2	1,120	.....	......		
					Tons.	Lbs.	Bush.	Lbs
5 Crops in 1902-3, after clover in 1901	.....	......	.....	......	20	800	202	
6 Crops in 1902-3, on plot where no clover was grown in 1901	.....	......	.....	......	15		154	4
Gain from use of clover	.....	......	.....	......	5	800	47	2
7 Crops in 1903, on plot where clover was allowed to grow two seasons	.....	......	.....	......	.....	......	200	4
8 Crops in 1903, on plot where no clover was grown in 1901	.....	......	.....	......	.....	......	134	4
Gain from use ofclover	.....	......	.....	......	.....	......	66	0

Division 3.	1902 Banner Oats. Yield of Oats Per Acre.		1902 Banner Oats. Weight of Straw Per Acre.		1903 Mangels. Yield Per Acre.		1902 Potatoes Everett. Yield Per Acre.		1903 Sugar Beets. Yield Per Acre.	
	Bush.	Lbs.	Lbs.		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs
9 Crops in 1902-3, after clover in 1901.	70	20	4,960		30	1,000	..	..		
10 Crops in 1902-3, on plot where no clover was grown in 1901	61	6	2,720		27	320	..	..		
Gain from use of clover	9	14	2,240		3	680	..	..		
11 Crops in 1902-3, after clover in 1901.	..	..	..	..	..	..	386	20	20	680
12 Crops in 1902-3, on plot where no clover was grown in 1901	..	..	..	..	..	..	346	40	16	1,040
Gain from use of clover	..	..	..	..	..	.	39	40	3	1,640

GROUP No. 3—*Concluded.*

Division 4.	1902 Corn, Selected Leaming. Yield Per Acre.		1903 Corn, Selected Leaming. Yield Per Acre.		1902 Banner Oats. Yield of Oats Per Acre.		1902 Banner Oats. Weight of Straw Per Acre.	1903 Preston Wheat. Yield of Wheat Per Acre.		1903 Preston Wheat. Weight of Straw Per Acre.
	Tons.	Lbs.	Tons.	Lbs.	Bush	Lbs.	Lbs.	Bus.	Lbs.	Lbs.
13 Crops in 1902-3, after clover in 1901	23	1,200	18	1,440	..	..	.. ..	..	..	
14 Crops in 1902-3, on plot where no clover was grown in 1901	17	720	14	1,200	..	..	.. ..	..	..	
Gain from use of clover	6	480	4	240	..	..	.. ..	..	..	
15 Crops in 1903, on plot where clover was allowed to grow two seasons	..	..	15	1,600	..	..	.. ..	..	..	
16 Crops in 1902-3, on plot where no clover was grown in 1901	..	..	7	..	..	..	.. ..	..	..	
Gain from use of clover	..	..	8	1,600	..	..	.. ..	..	..	
17 Crops in 1902-3, after clover in 1901	..	..	..	..	72	32	5,280	16	..	1,760
18 Crops in 1902-3, on plots where no clover was grown in 1901	..	..	..	..	63	18	3,280	14	40	1,400
Gain from use of clover	..	..	..	..	9	14	2,000	1	20	360

Division 5.	1902 Potatoes Everett. Yield Per Acre.		1903 Mensury Barley. Yield of Barley Per Acre.		1903 Mensury Barley. Weight of Straw Per Acre.	1902 Corn Selected Leaming. Yield Per Acre.		1903 Banner Oats. Yield of Oats Per Acre.		1903 Banner Oats. Weight of Straw Per Acre.
	Bus.	Lbs.	Bus.	Lbs.	Lbs.	Tons.	Lbs.	Bus.	Lbs.	Lbs.
19 Crops in 1902-3, after clover in 1901	396	..	51	32	2,640	..	..	..	..	
20 Crops in 1902-3, on plot where no clover was grown in 1901	353	20	50	..	2,520	..	..	..	..	
Gain from use of clover	42	40	1	32	120	..	..	..	..	
21 Crops in 1902-3, after clover in 1901	..	..	..	..	.. ..	22	1,600	82	12	3,920
22 Crops in 1902-3, on plot where no clover was grown in 1901	..	..	..	..	.. ..	16	800	76	16	3,240
Gain from use of clover	..	..	..	..	.. ..	6	800	5	30	680
23 Crops in 1903, on plot where clover was allowed to grow two seasons	.	..	..	..	.. ..	..	..	87	2	4,880
24 Crops in 1903, on plot where no clover was grown in 1901	..	..	..	..	.. ..	..	..	74	4	4,080
Gain from use of clover	..	..	..	..	.. ..	..	..	12	32	800

In all these examples also there are gains from the use of clover and on some of the plots they are so large as to be quite remarkable.

EFFECTS OF FERTILIZERS ON SPRING WHEAT, OATS, CLOVER AND BROME GRASS.

During the season of 1900, two series consisting in each case of sixteen one-eightieth acre plots were laid out, twelve of which in each set were treated with different fertilizers, and the remaining four left as check plots which received no fertilizers.

One set of these plots was sown with spring wheat of the variety known as Preston, another with a variety of oats known as Improved Ligowo. Two other series each consisting of nine plots were planned, one to be used for experiments with common red clover, and the other for the Awnless Brome grass *(Bromus inermis)*.

The object in view in these tests is to gain information as to the effects on crops sown on land in a fair average condition of fertility, of superphosphate of lime and Thomas' phosphate both used singly, also of superphosphate of lime with kainit and with kainit and nitrate of soda, and of Thomas' phosphate with kainit, and with kainit and nitrate of soda. In the several series of plots planned provision was also made for testing the relative value of barn-yard manure fresh and rotted, fresh slaked lime and of nitrate of soda alone in the proportions of 100 and 200 pounds per acre with a check plot between them.

The land chosen for this test was in a fairly good condition of tilth. The soil was a sandy loam which has been under cultivation since 1887, and has been cropped each year since with a suitable rotation of crops, and has received a dressing of barn-yard manure about once in four years. The last application of manure was in 1897, when it received about 12 tons per acre. The land was cropped in 1899 with experimental plots of grain, mostly barley.

It is proposed to grow the same crops on this land for some years, using the same fertilizers in the same quantities every second year. In this way it is hoped that some further information may be gained as to the effect of these different fertilizers when used singly and in combination on the important crops named. As this land was at the start in a fair average condition as to fertility, it may be regarded as representing in a general way average sandy loams on farms properly worked. The fertilizers were first applied in the spring of 1900, and a second time in the spring of 1902.

RESULTS OF THE APPLICATION OF FERTILIZERS TO SPRING WHEAT.

Sown April 27, Ripe August 15, 1903.

No. of plot.	Name of Variety, Preston.	Yield of Grain per acre.		Yield of Straw per acre.
		Bush.	Lbs.	Lbs.
1	Superphosphate, 400 lbs. per acre	18	—	2,840
2	Thomas' phosphate, 400 lbs. per acre	16	40	2,400
3	Thomas' phosphate, 800 lbs. per acre	20	—	3,040
4	Check	16	—	1,760
5	Thomas' phosphate, 400 lbs., kainit, 200 lbs. per acre	20	—	3,280
6	Superphosphate, 400 lbs., kainit, 200 lbs., per acre	16	40	3,400
7	Check	14	40	1,400
8	Thomas' phosphate, 400 lbs., kainit 200 lbs., nitrate soda 100 lbs. per acre	20	—	3,600
9	Superphosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	16	—	3,600
10	Barn-yard manure, mixed horse and cow, fresh, 12 tons per acre	11	40	1,720
11	Barn-yard manure, mixed horse and cow, well rotted, 12 tons per acre	13	40	1,980
12	Check	9	20	1,140
13	Fresh slacked lime, 1,000 lbs. per acre	11	40	1,460
14	Nitrate soda, 100 lbs. per acre	6	40	840
15	Check	12	—	1,480
16	Nitrate soda, 200 lbs. per acre	10	—	1,560

RESULTS OF THE APPLICATION OF FERTILIZERS TO OATS.

Sown April 27, Ripe August 17, 1903.

No. of plot.	Name of Variety, Improved Ligowo.	Yield of Grain per acre.		Yield of Straw per acre.
		Bush.	Lbs.	Lbs.
1	Superphosphate, 400 lbs. per acre	43	18	2,280
2	Thomas' phosphate, 400 lbs. per acre	52	32	2,480
3	Thomas' phosphate, 800 lbs. per acre	47	2	2,720
4	Check	42	12	1,960
5	Thomas' phosphate, 400 lbs., kainit, 200 lbs. per acre	44	24	2,080
6	Superphosphate, 400 lbs, kainit, 200 lbs. per acre	48	8	2,600
7	Check	43	18	2,280
8	Thomas' phosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	44	24	3,160
9	Superphosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	54	4	3,080
10	Barn-yard manure, mixed horse and cow, fresh, 12 tons per acre	57	22	3,760
11	Barn-yard manure, mixed horse and cow, well rotted, 12 tons per acre	64	24	3,560
12	Check	63	18	3,840
13	Fresh slacked lime, 1,000 lbs. per acre	77	22	3,960
14	Nitrate soda, 100 lbs. per acre	69	14	3,560
15	Check	62	12	3,280
16	Nitrate soda, 200 lbs. per acre	68	8	4,280

RESULTS OF THE APPLICATION OF FERTILIZERS TO AWNLESS BROME GRASS (*Bromus inermis*).

Crop cut July 9, 1903.

No. of Plot.	Fertilizers used.	Height of Brome Grass	Yield per Acre. Green.		Cured.	
		Inches.	Tons.	lbs.	Tons.	lbs.
1	Superphosphate, 400 lbs. per acre	38—42	8	1,360	3	1,600
2	Thomas' phosphate, 400 lbs. per acre	36—40	6	1,360	2	1,600
3	Thomas' phosphate, 800 lbs. per acre	34—38	4	240	1	1,440
4	Check	28—32	2	1,600	1	160
5	Thomas' phosphate, 400 lbs.; kainit, 200 lbs. per acre	31—35	3	400	1	400
6	Superphosphate, 400 lbs.; kainit, 200 lbs. per acre	31—35	3	400	1	480
7	Check	34—38	4	—	1	1,200
8	Thomas' phosphate, 400 lbs.; kainit, 200 lbs.; nitrate soda, 100 lbs. per acre	34—38	3	520	1	680
9	Superphosphate, 400 lbs.; kainit, 200 lbs.; nitrate soda, 100 lbs. per acre	36—40	4	720	1	1,600
10	Barn-yard manure, mixed horse and cow, fresh, 12 tons per acre	36—40	4	1,760	2	80
11	Barn-yard manure, mixed horse and cow, well rotted, 12 tons p. acre	36—40	3	800	1	800
12	Check	30—34	2	800	—	1,840
13	Fresh slacked lime, 1000 lbs. per acre	25—29	1	1,760	—	1,440
14	Nitrate soda, 100 lbs. per acre	25—29	3	1,200	1	800
15	Check	30—35	2	1,920	1	640
16	Nitrate soda, 200 lbs. per acre	33—38	4	640	1	1,680

RESULTS OF THE APPLICATION OF FERTILIZERS TO CLOVER.

First cutting July 9, second Sept. 3, 1903.

No. of Plot.	Fertilizers used.	Height of Clover. 1st Cutting.	Height of Clover. 2nd Cutting.	Yield per Acre. 1st Cutting. Green.		1st Cutting. Cured.		2nd Cutting. Green.		2nd Cutting. Cured.	
		Inches.	Inches.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
1	Superphosphate, 400 lbs. per acre	18–23	19–24	8	160	2	400	8	1,920	2	640
2	Thomas' phosphate, 400 lbs. per acre	18–23	19–24	9	1,120	2	1,200	10	80	2	1,280
3	Thomas' phosphate, 800 lbs. per acre	20–25	20–25	9	1,240	2	1,120	9	440	2	720
4	Check	18–23	18–23	8	1,880	2	760	9	1,240	2	1,080
5	Thomas' phosphate, 400 lbs.; kainit, 200 lbs. per acre	20–25	18–23	8	960	2	960	9	80	2	640
6	Superphosphate, 400 lbs.; kainit, 200 lbs. per acre	18–23	17–22	7	1,040	2	240	9	640	2	560
7	Check	16–21	18–23	7	640	2	80	9	1,520	2	1,120
8	Thomas' phosphate, 400 lbs.; kainit, 200 lbs.; nitrate soda, 100 lbs. per acre	18–23	20–25	6	1,600	2	—	9	560	2	960
9	Superphosphate, 400 lbs.; kainit, 200 lbs.; nitrate soda, 100 lbs. per acre	18–23	20–25	6	1,200	1	1,760	10	—	2	1,440
10	Barn-yard manure, mixed horse and cow, fresh, 12 tons per acre	18–23	20–25	6	480	1	1,200	11	1,360	3	320
11	Barn-yard manure, mixed horse and cow, well rotted, 12 tons per acre	18–23	20–25	7	80	2	1,200	10	160	2	1,120
12	Check	16–21	18–23	4	1,440	1	1,840	9	80	2	640
13	Fresh slacked lime, 1,000 lbs. per acre	18–23	20–25	7	1,040	2	560	11	1,280	2	1,840
14	Nitrate soda, 100 lbs. per acre	18–23	20–25	6	1,600	1	1,600	8	1,600	2	640
15	Check	18–23	18–23	7	1,600	2	—	8	1,920	2	480
16	Nitrate soda, 200 lbs. per acre	20–25	20–25	8	1,920	2	880	11	320	2	1,840

CORRESPONDENCE.

A large correspondence has been maintained during 1903 between the farmers of Canada and the officers of the experimental farms.

CENTRAL EXPERIMENTAL FARM.

The following is a summary of the letters received and sent out at the Central Experimental Farm from December 1, 1902, to November 30, 1903; also the number of reports, bulletins and circulars forwarded by mail during the same period.

	Letters received.	Letters sent.
Director	40,490	17,081
Agriculturist	3,251	2,815
Horticulturist	1,237	1,266
Chemist	1,234	1,163
Entomologist and Botanist	3,059	2,664
Experimentalist (part of year)	386	372
Poultry manager	1,587	1,145
Accountant	824	799
	52,068	27,305

A large number of the letters received by the Director are applications for samples of grain or for the publications of the farms a considerable proportion of which are

answered by sending the correspondents the material asked for, accompanied by circular letters. This explains why the number of letters received so much exceeds the number sent out..

Circular letters including circulars sent with samples of seed grain	32,074
Reports and bulletins mailed	248,673

BRANCH EXPERIMENTAL FARMS.

The correspondence with the Superintendents of the branch experimental farms is also large, as is shown by the following figures:—

	Letters received.	Letters sent.
Experimental Farm, Nappan, N.S.	1,840	1,685
Experimental Farm, Brandon, Man.	3,767	2,848
Experimental Farm, Indian Head, N.W.T.	4,926	4,980
Experimental Farm, Agassiz, B.C.	2,767	2,570
	13,300	12,083

Much additional information has also been sent out from the branch farms in printed circulars.

By adding the correspondence conducted at the branch farms to that of the central farm it will be seen that 65,365 letters were received and 39,358 sent out during the year.

A large proportion of these letters are from correspondents who seek information on all sorts of subjects relating to farm work, stock raising, dairying, fruit growing, poultry raising, &c. For the first two years after the experimental farms were established the letters received averaged 9,300 each year, whereas during the past six years the annual average has amounted to 64,411, showing the great growth of this branch of the service.

During the same period the number of reports and bulletins sent out each year has averaged 214,691. Thus a constant stream of information is going out from the experimental farms, helpful to farmers in their endeavours to make their calling more profitable.

CO-OPERATIVE EXPERIMENTS BY CANADIAN FARMERS.

The Dominion experimental farms were established in 1887 and in the spring of 1888 the useful work of assisting farmers with samples of high class seed grain for test was begun; hence they have co-operated with the experimental farms from the start in the endeavour to find out which varieties of the several cereals were the earliest to ripen and the most generally productive under the many different climatic conditions found in this country. In 1888 the number of samples distributed was 2,760. Every year since then this useful branch of the work has been continued, it rapidly assumed large proportions, and is much appreciated by farmers everywhere. The greatest pains are taken to send the grain out perfectly clean. Sometimes with the most approved cleaning apparatus this cannot be thoroughly done and in all such cases the grain is hand-picked. Many thousands of pounds are thus treated every year. Every effort is also made to have the samples true to name and of the most productive strains.

During the past ten years the number of samples distributed annually has averaged 35,030 and the total number sent out from 1888 to the end of 1903 is 421,312, which has involved the use of over 638 tons of first class material. Of these samples 368,245 have been sent out from the Central Farm at Ottawa and 53,067 from the branch farms. Hundreds of letters are received every year from farmers expressing their

gratitude for the samples sent, as in this way they obtain at no cost beyond their own labour, pure seed of the choicest quality. There is no doubt that the quality, character and productiveness of the grain raised throughout the entire Dominion has been influenced very largely by the placing of these samples in the hands of so many good farmers.

During the season of 1903 the distribution was somewhat modified. While in the past the greater part of the samples distributed have weighed three pounds each, for the last three years there have been sent to a limited number of farmers who have taken a special interest in this work enough of the leading cereals to sow one-tenth of an acre. To these parties 8 pounds of oats or 10 pounds of wheat or barley have been sent. These larger samples have been very much appreciated, but since in some instances it produced dissatisfaction on the part of those who received the smaller samples, it has been thought best to put all the applicants on the same footing, and send to all who apply for samples of these cereals 4 pounds of oats and 5 pounds of wheat or barley, which would be enough in each case for a twentieth acre plot. The samples of pease, Indian corn and potatoes weigh 3 pounds each, as heretofore.

The samples sent from the Central Experimental Farm during the early months of 1903 have been distributed as follows:—

Name of Grain.	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	Northwest Territories.	British Columbia.
Oats	508	1,083	990	3,228	2,079	519	539	84
Barley	127	336	177	1,362	676	185	227	38
Wheat	245	496	571	1,859	558	304	380	54
Pease	24	165	179	740	163	100	93	22
Indian Corn	30	178	145	512	794	104	81	25
Potatoes	138	757	579	3,687	2,648	715	959	173
Total	1,072	3,015	2,641	11,388	6,918	1,927	2,279	396

Total number of samples distributed, 29,636.
Number of applicants supplied, 29,592.

Total number of packages of each sort distributed:—

Oats	9,030
Barley	3,128
Wheat	4,467
Pease	1,486
Indian corn	1,869
Potatoes	9,656
Total	29,636

The following list shows the number of packages which have been sent out of the different varieties:—

Name of Variety.	Number of Packages.
Oats.	
Tartar King	1,667
Waverley	1,597
Banner	1,263
Improved Ligowo	1,256
Goldfinder	920
Wide Awake	902
Abundance	893
Black Beauty	532
Total	9,030
Barley.	
Mensury	1,008
Odessa	752
Rennie's Improved	673
Sidney	302
Canadian Thorpe	210
Standwell	183
Total	3,128
Wheat.	
Preston	967
Percy	912
Stanley	874
Red Fife	840
Wellman's Fife	750
Emmer (Spelt)	124
Total	4,467
Pease.	
Canadian Beauty	463
Black Eyed Marrowfat	360
Prussian Blue	381
Wisconsin Blue	282
Total	1,486

Name of Variety.	Number of Packages.
Indian Corn.	
Selected Leaming	512
Longfellow	325
Early Mastodon	321
King of the Earliest	273
Eureka	161
North Dakota White	102
White Cap Yellow Dent	62
Angel of Midnight	54
Cloud's Early Yellow	30
Early Butler	29
Total	1,869
Potatoes.	
Early Sunrise	1,303
Early Harvest	1,117
Carman No. 1	994
Everett	861
Early Andes	652
Rochester Rose	593
Maggie Murphy	582
Surprise	548
Honeoye Rose	403
Vigorosa	379
American Wonder	319
Early White Prize	298
Bovee	275
New Queen	247
Sir Walter Raleigh	203
Uncle Sam	196
Prize Taker	181
Canadian Beauty	178
Wonder of the World	165
Early Rose	162
Total	9,656

DISTRIBUTION OF SAMPLES FROM THE BRANCH EXPERIMENTAL FARMS.

Samples of three pounds each were also distributed from the branch experimental farms as follows:—

Experimental Farm, Nappan, N.S.—	
Oats	212
Wheat	68
Barley	62
Pease	42
Buckwheat	16
Winter Rye	1
Potatoes	354
Total	755

Experimental Farm, Indian Head, N.W.T.—	
Oats	411
Barley	196
Wheat	278
Pease	232
Flax, Rye, &c	41
Potatoes	497
Total	1,655

Experimental Farm, Brandon, Man.—		Experimental Farm, Agassiz, B.C.—	
Samples of grain of all sorts........	161	Oats	163
Potatoes..	241	Barley...........................	128
		Wheat...	217
		Pease............................	148
		Potatoes..	310
Total.	402	Total..................... .	966

These samples added to the number distributed by the Central Experimental Farm make a total of 33,413. It is gratifying to find so large an army of co-experimenters willing to engage in this good work.

TESTS OF THE VITALITY OF SEED GRAIN AND OTHER SEEDS.

The number of samples of seeds tested during the season of 1902-3 to find out the proportion which would germinate was 2,091.

This useful work has been carried on every year since the experimental farms were established. For the first four years the average number of samples tested was 790 per annum, but for the past twelve years the average number has been 2,015 each season. They have consisted largely of samples of cereals, the vitality of which was doubtful owing to bad harvest weather or to some other unfavourable condition. Many samples of timothy, clover and other seeds which farmers buy and want to know whether they were good, have also been sent for test. The total number of samples which have been tested and reported on since this work was begun is 29,451. Farmers are invited to send in every year any samples which may be of doubtful vitality through injury in harvesting or storing or from any other cause, so that their germinating power may be determined and their usefulness for seed purposes ascertained.

Closely associated with this branch of work is the study of the length of time during which grain and seeds of different sorts will hold their vitality. In many instances the decrease in vitality with age is much more rapid than is generally supposed. In 1898, some experiments were begun in this direction by the selection of twelve samples, all vigorous growing sorts and all from the crop of 1897. Each of these samples was placed in a cotton bag and stored on an open shelf, on the shady side of the room in an ordinary office building, midway between the floor and ceiling, where they would get as equal conditions of temperature as could be had. They were kept in this way and tested every year. The samples consisted of three different sorts of wheat, four of oats, two of barley, two of pease, and one of flax seed. The wheats were samples of Red Fife grown at Indian Head, and Preston and Red Fern, both grown at Ottawa. The oats were Banner, grown at Ottawa and Indian Head, one sample of Prize Cluster, grown at Ottawa, and one sample of Scottish Chief. This was grown at Indian Head.

In wheat the average percentages of vitality for the three varieties taken from the crop of 1897, during the six years' test stand as follows : in 1898, the samples averaged 80 per cent of vitality; in 1899, they averaged 82·3 per cent, a slight increase; in 1900, they dropped to 77·3 per cent; in 1901, to 37 per cent; in 1902, to 15 per cent, and in 1903, to 6 per cent. The average of 6 per cent in 1903 is entirely due to a remnant of vitality of 17 per cent in the Red Fern, the Red Fife and Preston having lost their germinating power entirely. It is evident then that the growing of wheat which has been taken from mummies cannot be true.

In oats the average percentage of vitality for the four samples during the six years' test stood as follows: in 1898, it was 90·2 per cent; in 1899, 93 per cent; in 1900, 78·2 per cent; in 1901, 67 per cent; in 1902, 54 per cent, and in 1903, 29·5 per cent. In no instance have oats entirely lost their vitality during this period. Of barley, two

varieties were chosen, one a two-rowed sort known as Canadian Thorpe, grown at Indian Head, and the other, a six-rowed variety, Mensury, grown at Ottawa. The average percentage of vitality of these two barleys during the time they have been under trial has been as follows: 1898, 97 per cent; 1899, 91 per cent; 1900, 78·5 per cent; 1901, 36 per cent; 1902, 19·5 per cent, and in 1903, 7·5 per cent. The two-rowed variety entirely lost its vitality by 1902, while the six-rowed has retained 15 per cent of vitality to the end of the six years' test.

Two varieties of pease were tested, Daniel O'Rourke and Large White Marrowfat. The average percentage of vitality shown by these two varieties was as follows: In 1898, 94 per cent; 1899, 95 per cent; 1900, 88 per cent; 1901, 64 per cent; 1902, 64 per cent, and in 1903, 6 per cent. A sample of flax was also tested, a single example. This gave, in 1898, 81 per cent; 1899, 82 per cent; in 1900, 75 per cent; in 1901, 49 per cent; in 1902, 26 per cent, and in 1903, 24 per cent.

From these tests we gather, that when any of the varieties of grain or seed referred to are kept over for sowing, they may be expected to be about as high in germinating power and in vigour of growth the second year as they were the first. In the third year there is a slight falling off, and in the fourth, fifth and sixth years, a rapid decline in proportion of vitality.

RESULTS OF TESTS OF SEEDS FOR VITALITY, 1902-03.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	677	100·0	26·0	83·9	3·8	87·7
Barley	359	100·0	28·0	87·6	5·4	93·0
Oats	516	100·0	5·0	85·2	4·8	90·1
Rye	2	82·0	81·0	77·0	4·5	81·5
Pease	126	100·0	14·0	....	....	79·6
Grass	106	98·0	5·0	....	....	78·7
Clover	207	97·0	1·0	....	....	70·3
Corn	4	80·0	14·0	....	....	43·0
Vetches	2	53·0	24·0	....	....	38·5
Beans	2	92·0	90·0	....	....	91·0
Onions	19	93·0	0·0	....	....	56·4
Celery	9	83·0	6 0	....	....	49·5
Carrots	2	27·0	4·0	....	....	15·5
Radish	8	80·0	39·0	....	....	46·2
Lettuce	16	93·0	1·0	....	....	53·5
Cabbage	7	75·0	8·0	....	....	44·8
Parsley	3	34·0	1·0	....	....	12·3
Tobacco	2	45·0	21·0	....	....	33·0
Cauliflower	3	59·0	53·0	....	....	56·3
Squash	2	72·0	12·0	....	....	42·0
Turnip	1	56·0	56·0	....	....	56·0
Spinach	1	9·0	9·0	....	....	9·0
Cress	1	38·0	38·0	....	....	38·0
Kohl Rabi	1	23·0	23·0	....	....	23·0
Leeks	1	64·0	64·0	....	....	64·0
Brussels Sprouts	1	20·0	20·0	....	....	20·0
Flax	1	60·0	60·0	....	....	60·0
Endive	1	29·0	29·0	....	....	29·0
Water Cress	1	1·0	1 0	....	....	1·0
Parsnips	1	76·0	76·0	....	....	76·0
Salsify	1	85·0	85·0	....	....	85·0
Beets	1	50·0	50·0	....	....	50·0
Rhubarb	1	64·0	64·0	....	....	64·0
Mustard	1	59·0	59·0	....	....	59·0
Ash Seed	1	16·0	16·0	....	....	16·0
Maple Seed	1	4·0	4·0	....	....	4·0
Total number of samples tested, highest and lowest percentage.	2,088	100·0	0·0	....	....	....

TABLE showing Results of Grain Tests for each Province:—

ONTARIO.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	233	100·0	26·0	77·7	4·8	82·6
Barley	125	100·0	52·0	85·7	6·5	92·2
Oats	142	100·0	52·0	92·8	3·9	96·8

QUEBEC.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	79	100·0	63·0	87·1	2·6	89·7
Barley	72	100·0	28·0	86·5	5·4	91·9
Oats	64	100·0	60·0	91·8	2·8	94·6

MANITOBA.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	62	100·0	58·0	85·0	3·7	88·7
Barley	15	98·0	63·0	88·0	3·2	91·2
Oats	54	100·0	5·0	76·9	5·7	82·7

NORTH-WEST TERRITORIES.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	141	100·0	39·0	84·2	4·0	88·2
Barley	65	100·0	83·0	91·6	3·1	94·8
Oats	126	100·0	12·0	68·6	8·6	77·3

NOVA SCOTIA.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	51	100·0	60·0	88·2	3·0	91·2
Barley	52	100·0	52·0	85·0	7·8	92·5
Oats	33	100·0	78·0	91·0	3·6	94·6

NEW BRUNSWICK.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	61	100·0	61·0	89·9	2·7	92·7
Barley	12	100·0	84·0	91·5	3·5	95·0
Oats	35	100·0	89·0	93·2	2·6	95·9

PRINCE EDWARD ISLAND.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	40	100·0	82·0	93·1	2·3	95·5
Barley	18	100·0	85·0	94·9	1·6	96·5
Oats	50	100·0	92·0	95·3	2·3	97·6

BRITISH COLUMBIA.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	10	100·0	86·0	94·0	1·4	95·4
Oats	12	100·0	79·0	88·4	4·2	92·6

(Signed) WILLIAM T. ELLIS.

METEOROLOGICAL OBSERVATIONS.

TABLE of Meteorological Observations taken at the Central Experimental Farm, Ottawa, 1903; maximum and minimum temperatures, with date of occurrence, and mean temperature for each month, also rainfall and snowfall and total precipitation.

Month.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days Precipitation.	Heaviest in 24 hours.	Date.
	F°	F°	F°	F°	F°		F°		in.	in.	in.		in.	
January...	20·29	2·29	17·99	11·28	38·0	30th	—29·8	19th	0·36	22·50	2·61	18	0·40	11th 21st
February..	24·62	7·95	16·66	16·28	41·8	28th	—22·2	18th	1·29	27·00	3·99	16	0·60	8th
March.....	41·68	25·66	16·02	33·67	62·3	19th	0·5	3rd	1·69	0·50	1·73	13	0·60	23rd
April......	55·55	32·03	23·51	43·78	82·2	30th	14·0	5th	0·85	3·00	1·15	8	0·50	7th
May	74·03	43·90	30·12	58·96	90·8	19th	22 5	2nd	0·24	.....	0·24	8	0·09	4th
June	73·95	51·09	22·85	62·51	88·0	6th	41·8	1st	7·30	.....	7·30	15	2·03	12th
July........	77·19	58·29	18·90	67·74	89·8	8th	44·5	27th	4·02	......	4·02	17	1·40	2nd
August ...	71·99	51·29	20·70	61·64	81·8	22d	43·6	8th	4·31	......	4·31	18	1·39	20th
September.	70·78	47·52	23·26	59·15	86·8	13th	33·5	30th	2·25	......	2·25	7	1·40	17th
October ...	57·53	38·68	18·84	48·10	70·5	1st	20·5	28th	3·50	......	3·50	15	1·05	10th
November.	37·63	22·35	15·27	29·98	61·0	4th	—0·1	26th	0·62	4·50	1·07	11	0·33	5th
December.	20·40	0·84	19·55	10·61	37·0	13th	—23·6	27th	......	27·50	2·75	18	0·40	20th
									26·43	85·00	34·92	164		

Rain or snow fell on 164 days during the 12 months.

Heaviest rainfall in 24 hours, 2·03 inches on June 12.

Heaviest snowfall in 24 hours, 6 inches, on February 8.

The highest temperature during the 12 months was 90·8°, on May 19.

The lowest temperature during the 12 months was —29·8°, on January 19.

During the growing season rain fell on 8 days in April, 8 days in May, 15 days in June, 17 days in July, 18 days in August, and 7 days in September.

September shows the lowest number of days with precipitation, viz., 7.

Total precipitation during the 12 months, 34·92 inches, as compared with 36·10 inches during 1902.

Rainfall, Snowfall and Total Precipitation from 1890 to 1903, also the average annual amount that has fallen.

Year.	Rainfall.	Snowfall.	Total Precipitation.
	In inches.	In inches.	In inches.
1890	24·73	64·85	31·22
1891	30·19	73·50	37·54
1892	23·78	105·00	34·28
1893	31·79	72·50	39·04
1894	23·05	71·50	30·20
1895	27·01	87·50	35·76
1896	21·53	99·75	31·50
1897	24·18	89·00	33·08
1898	24·75	112·25	35·97
1899	33·86	77·25	41·63
1900	29·48	108·00	40·27
1901	29·21	97·25	38·91
1902	25·94	101·75	36·10
1903	26·43	85·00	34·92
Totals for 14 years	375·93	1,245·10	500·42
Yearly average for 14 years	26·85	88·93	35·74

RECORD of Sunshine at the Central Experimental Farm, Ottawa, for the Years 1898 to 1903.

MONTHS.	1898.				1899.				1900.			
	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per Day.	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per Day.	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per Day.
January	21	10	97·4	3·14	18	13	91·2	2·94	18	13	76·4	2·46
February	15	13	67·5	2·41	19	9	102·1	3·64	20	8	110·2	3·93
March	26	5	171·5	5·53	17	14	124·1	4·00	26	5	177·9	5·73
April	29	1	233·8	7·79	26	4	228·8	7 62	26	4	212·7	7·09
May	30	1	186·3	6·01	27	4	225·4	7·27	27	4	241·6	7·79
June	29	1	184·9	6·16	29	1	257·1	8·57	27	3	282·2	9·40
July	30	1	272·8	8·80	29	2	271·3	8·75	29	2	225·1	7·26
*August	....	....	....	......	31	0	271·2	8·74	30	1	270·7	8·73
September	27	3	166·9	5·23	22	8	128·9	4 29	22	8	164·4	5·48
October	21	10	106·0	3·41	23	8	120·4	3·88	26	5	148·7	4·79
November	21	9	91·3	3·04	17	13	77·0	2·56	18	12	71·7	2·39
December	15	16	54·3	1·75	17	14	50·1	1·61	16	15	34·0	1·09

MONTHS.	1901.				1902.				1903.			
	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per Day.	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per Day.	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per Day.
January	20	11	94·6	3·05	21	10	97·2	3·13	18	13	57·5	1·85
February	20	8	120·9	4·31	20	8	93·3	3·33	19	9	94·0	3·35
March	19	12	82·4	2·62	25	6	136·2	4·39	24	7	121·4	3·91
April	18	12	137·1	4·57	26	4	161·9	5·39	25	5	181·7	6·05
May	25	6	200·8	6·47	27	4	229·8	7·41	31	0	278·3	8·97
June	29	1	269·4	8·98	29	1	185·6	6·18	24	6	157·7	5·25
July	29	2	245·8	7·92	31	0	239·9	7·73	30	1	230·1	7·42
August	29	2	226·1	7·29	31	0	252·0	8·12	25	6	206·4	6·65
September	26	4	202·3	6·74	25	5	145·0	4·83	28	2	174·4	5·81
October	27	4	126·3	4·07	24	7	99·2	3·20	26	5	125·9	4·06
November	19	11	72·4	2·41	21	9	82·5	2·75	23	7	96·4	3·21
December	16	15	45·4	1·46	16	15	58·4	1·88	20	11	53·2	1·71

* Instruments out of order.

(Sgd.) WILLIAM T. ELLIS,
Observer.

VISIT TO THE EASTERN EXPERIMENTAL FARM.

A visit was paid to the experimental farm at Nappan, N.S., August 3 to 6. The weather was very fine; the hay harvest was then being rapidly pushed and the crop was saved in excellent condition. The severe drought which had prevailed during May and up to June 23 had resulted in a stunted growth in the crops, but after the drought was broken by copious rains they all improved rapidly; the growth of hay thickened considerably at the base and the crop which earlier promised to be almost a failure resulted in about two-thirds of an average yield. The hay produced on the upland was better than that on the marsh.

At the date of my visit the crops in general looked well. In the uniform trial plots of grain the wheat promised about an average yield, the oats and barley above an average. Indian corn was growing well, but was not so far advanced as usual owing to the cold backward season. Turnips were looking remarkably well. A considerable area of additional land had been brought under crop. The dairy cattle were looking well and milking fairly well. The horses, swine, sheep and poultry were all in good condition. Inspection was made of every branch of the work, and the general condition of the farm was very satisfactory and showed evidence of careful supervision. The buildings also and implements were found in good order.

The orchards had made good progress and many of the apple trees were well laden with fruit; the vegetable garden was in a thriving condition, and the flower beds full of bloom. The trees and shrubs planted about the grounds, notwithstanding the drought, had made a satisfactory growth.

A JOURNEY TO THE WEST.

THE EXPERIMENTAL FARM AT BRANDON, MAN.

Leaving Ottawa August 14, Brandon was reached on the 16th, where several days were spent in inspecting the buildings and crops and everything was found in excellent order. The field crops promised a good harvest, some of them were already cut and the weather was fine for harvest purposes. Wheat cutting began here on August 17, and subsequently made rapid progress. The different varieties of wheat, oats and barley were carefully examined and notes taken on their growth, condition and character. The oat crop was very heavy. The many varieties of Indian corn, field roots and potatoes under trial here were found to have made strong and healthy growth. When cut green for ensilage, Indian corn subsequently gave, in experimental plots, as high as 28 tons per acre. The heaviest yielding sort of mangel gave over 40 tons per acre. The plots of different varieties of flax were also interesting and promising.

The orchards of cross-bred and seedling crab and apple trees are being rapidly extended and many of the seedlings earlier planted were bearing heavy crops, and some of the cross-bred apples were bearing their first fruits. Many of these are attracting much attention and some progress has been made in propagating and distributing them. Many of the native seedling plums were in fruit and several of the earlier sorts ripened before frost occurred. Some of the earlier ripening sorts of good quality will be propagated. The trees and shrubs forming the Arboretum are doing well, and each season adds to their growth and their number. The Arboretum is now one of the most attractive spots on the farm.

The horses, cattle, swine and poultry were all in good condition and showed evidence of constant and intelligent care.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

This farm was next visited in time to see most of the more important crops b fore they were harvested. The yields of grain were heavy, especially those of oat The experimental plots were most remarkable for weight of crop; the heaviest yield was the Banner, which gave at the rate of 136 bushels 26 pounds per acre. The be twelve varieties in these plots gave the unprecedented average yield of 128 bushels pounds per acre. Barley also gave excellent crops of very plump grain. On the plo one of the two-rowed sorts gave 80 bushels, 40 pounds, and one of the six-rowed varieti at the rate of 71 bushels 12 pounds per acre. Among the highest yielding wheats w the Preston, which gave a crop of 43 bushels 10 pounds per acre. The best field cr was from Huron, one of the cross-bred wheats produced at the experimental farm this gave 40 bushels 24 pounds per acre.

The cold and backward weather retarded the ripening of the grain and it becan necessary to cut some of it before it was fully matured, and most of the grain so trea was more or less shrunken. Several of the late ripening sorts of wheat which were n cut when the frost came on September 5, were touched with frost. Pease were not ful ripened at that time, and consequently most of the varieties were more or less injure Flax was a fair crop.

Good returns were had from Indian corn cut green for ensilage, field roots also ga very good crops. The yield of potatoes was larger than ever known before, the heavie crop, that of Carman No. 1, in the experimental plots being at the rate of 711 bushe 28 pounds per acre. The cool season seems to have been favourable to the growth the potato.

The early ripening varieties of wheat under trial have this year shown themselv relatively earlier than usual. The Preston, which has averaged during the past nin years from four to six days earlier than the Red Fife, was this year from ten to twel days earlier, and in some instances the advantage in earliness was fully two weeks favour of Preston. The same may be said of other early ripening sorts. This was n doubt due to the cool and backward weather; the earlier sorts probably having th power of maturing more rapidly under lower temperatures.

In the orchards of Siberian crabs and cross-bred apples, the crab trees were we laden. The fruit makes excellent jelly although it is too small for most other purpose The cross-bred apple trees, the fruit of which is large enough to be serviceable for dom estic use, are young and only beginning to fruit. The trees seem to be equally hard with those of the crabs. Trees and shrubs for shelter and ornamental purposes hav been largely propagated and distributed among settlers all over the Territories, who ar using them to advantage and thus making their home surroundings more attractiv

The horses, cattle, swine and poultry were all in good condition and everything i connection with the buildings, implements, &c., was in good order, indicating carefu management.

REGINA AND PRINCE ALBERT DISTRICTS.

After leaving Indian Head, the Regina district was visited, also the country fro Regina to Prince Albert. This was during the last week in August and the first i September, at which time the crops were very promising. By September 1 a conside able part of the wheat had been cut and harvesting was progressing rapidly. In Prin Albert several farms were visited, but the grain was not fully matured. At Rosther the season appeared to be further advanced and a drive of over fifty miles was tak over that district and a number of farmers seen, some of whom had from 100 to 2 acres of wheat. Three years ago very little wheat was brought in at this point and t town had no elevators. Now there are six elevators built and it is said that in 19 500,000 bushels of wheat were marketed at this point, and it was expected that 600,0 bushels would be brought to Rosthern during the season of 1903.

EXTENSIVE SETTLEMENT.

Settlement has progressed very rapidly along this line of railway and the homesteads for many miles back have nearly all been taken up. About 60 miles south-east of Rosthern, on the Hoodoo plains towards the Quill lakes a very large tract is being taken up by a body of German Catholics from the United States. In conversation with one of their priests, met at Rosthern, it was learned that about 2,000 of these people had gone into that district this spring, that many more were expected during the autumn, and a still larger number next season. It is expected that this settlement will occupy the greater part of forty to fifty townships. The line of the Canadian Northern Railway now being built will run through this part of the country.

Many of the towns from Regina to Prince Albert have doubled and some of them trebled their population within the past three years, and many new towns have sprung up and are growing rapidly, which at that time had no existence. Twenty-five elevators were counted at different points along this line of railway.

JOURNEY TO BATTLEFORD.

On returning to Saskatoon, a drive of 200 miles was taken in looking over the country between this point and Battleford. A very large proportion of the land seen was of excellent quality, especially much of that along the proposed line of the Canadian Northern Railway on the north side of the Saskatchewan river.

Arriving at Battleford on the day fixed for the holding of the Annual Agricultural Fair, an opportunity was afforded of seeing a good collection of the agricultural products of that district. The grain shown at that time was not fully ripe, but was fairly well advanced.

COLONY OF NESTORIANS.

Among other nationalities exhibiting on this occasion were the Nestorians, from Persia, who have taken land within a few miles of the town. They made a very creditable display of vegetables. In an interview with one of their chief men I was told that these people were very well satisfied with this part of Canada and expected a larger influx of settlers from their country next year.

BARR COLONISTS.

About Saskatoon and along the road to Battleford, also in Battleford itself, many of the Barr colonists were met with. The land chosen for this colony begins about forty miles north-west of Battleford and extends in the same direction to a distance of ninety miles from Battleford, and near that point the town of Lloydminster has been founded. Of the 1,200 people who came out who were entitled to homesteads, about 400 have taken up land in the British settlement. The others have distributed themselves among other settlers all over the country and have taken up homesteads in proximity to places where they could obtain employment. They are engaged in many different lines of work, in the towns, among the farmers, and on the railways. All those we had the opportunity of talking to seemed satisfied with the country, and most of them expected to go on their land to begin their settlement duties next spring.

There is much difficulty in obtaining lumber in many parts of the North-west this year for the many new buildings required. A part of what is used in the Battleford district has been brought in from British Columbia and hauled up from Saskatoon, while a part has been floated donw the north Saskatchewan river, in barges, from Edmonton.

DOUKHOBOR VILLAGES.

During these journeys opportunity was afforded for visiting several villages of the Doukhobors. Each village consists of a number of houses, one for each family, neatly

built with logs and plaster, with, in some instances, an attempt at ornamentation on the plaster work. Their houses are very clean and neat inside, but they appear to have little idea of ventilation, as no provision seems to be made in any of the houses visited for opening the windows. They all have gardens about their houses, in which the leading vegetables are grown. Sunflowers and poppies are also always abundant. Young and old eat quantities of the seeds of both these plants. In the neighbourhood of these villages a large quantity of land was broken and under crop. Belonging to one village was 400 acres of flax, which promised a very good yield. The crop of wheat belonging to the Doukhobors were the poorest seen anywhere and it was evident that their preparation of the land was very crude, although their oat crops were better. They will doubtless soon improve in this particular. The villages visited are now well supplied with cattle and horses. These people are evidently making progress.

VISIT TO THE EXPERIMENTAL FARM AT AGASSIZ, B.C.

Returning to Regina, the train was taken for Agassiz, B.C., where a week was spent in looking into the many details connected with the experiments in progress there with fruits, cereals and fodder plants. The yields of hay and grain had been heavy, but, owing to wet weather, not much threshing had been done up to that time. The yields of the barley plots, however, had been determined and the best of them ranged from 70 to 80 bushels per acre. The fodder corn was very heavy and almost fit to cut. The root crop, also, was very promising.

The fruit crop at the Agassiz Farm was rather below the average, although some varieties were bearing well. This is the general condition throughout the coast climate and has probably been due to very wet weather in the spring, which prevented the fruit from setting. On Vancouver island, where there was less rain, the crop is much better. Plums have yielded well, but the 'plum rot' has destroyed a considerable proportion of the fruit in the orchards on the mainland. This troublesome pest has proved a discouragement to plum growers in the coast climate. In the drier interior country, fruit trees have yielded abundant crops and there the 'plum rot' causes very little loss.

Among the large number of different sorts of fruits under trial at the experimental farm at Agassiz, while some are of excellent quality, others have proved inferior. These latter are being discarded and a list of them will be published for the information of fruit growers. Selections have been made of those of the highest quality and productiveness—and, in plums, of those most free from rot—for planting in commercial orchards, where instead of having one or two trees, from five to ten trees of each sort are being planted.

A general inspection was made of the field crops, the stock, buildings, &c., and all were found in good condition.

New Westminster and Victoria were also visited and arrangements made for a fine display of the products of the Agassiz Farm at each of the large exhibitions to be held at these points.

CALGARY AND EDMONTON DISTRICTS.

On the return journey, a few days were spent in looking over the country from Calgary to Edmonton. The progress in settlement all along this line during the past three or four years has been marvellous. Many flourishing towns were seen along the line, some of them only two or three years old. Nearly all the older towns have increased in size and population very much of late. The homesteads are nearly all taken up for from twenty to thirty miles on both sides of the railway and for nearly the whole distance. At Edmonton they are all disposed of for nearly seventy miles east and from thirty-five to forty miles west. Fully 14,000 settlers have gone into the Edmonton district within the past three or four years, a large proportion of whom are

Americans and Galicians. The people who have come in from the United States make excellent settlers and are well trained to the work devolving on new settlers in this western country. The Galicians are making good progress, are fast adapting themselves to the conditions in which they are placed, and are learning English. A number of schools have been established among them.

The town of Edmonton has made phenomenal growth and the prices asked for property there are in some instances more than could be realized in cities in the east with five times the population which Edmonton now has.

Returning, a day was spent at the thriving town of Innisfail, where a drive was taken through a part of that district and some fine farms seen. An opportunity was also afforded of meeting some of the leading farmers of that locality at the prosperous and well equipped creamery which has been established there.

VISIT TO SOUTHERN ALBERTA.

A trip was made to Macleod, Pincher and Cowley, where some fine fields of fall wheat were seen; also to Lethbridge, and thence to the Mormon settlements south-east of that place, the towns visited being Stirling, Raymond, and Magrath. Each of these places has increased considerably in population during the past year, but the most remarkable growth has been at Raymond. Two years ago I visited the spot on which this town now stands, when a surveyor's tent was the only thing to be seen on the wide expanse of prairie. Now there is a town of about 1,500 inhabitants, possessing a very large brick school, a meeting house, hotel, stores, bank and numerous dwellings.

BEET SUGAR FACTORY.

There is also an extensive beet sugar factory nearly completed at a cost of about $400,000, which will have a capacity for working up 350 tons of beets a day. This factory is very complete and modern in all its appliances. Some good fields of beets were seen in the neighbourhood, but in many instances the land on which they had been grown had not been sufficiently worked to give the best results. Some of the better fields were expected to give from 10 to 12 tons per acre. The beets grown there are said to be very rich in sugar. The total crop is estimated at from 10,000 to 12,000 tons, which will be sufficient to keep the factory running from thirty to forty days. Another year, under improved conditions, it is expected that a better and larger crop will be produced.

QUALITY OF WHEAT SEEN AT ELEVATORS.

Returning eastward, some time was spent at Regina, Indian Head, Virden and Brandon. Threshing was being pushed rapidly along and large quantities of wheat were being delivered at the elevators. Most of that being received was grading No. 1 and No. 2 Northern, with an occasional lot of No. 2 Hard. This wheat was coming mainly from the crops grown on stubble land, since they were the earliest to ripen. At all the localities named, excepting Indian Head, the wheat crop was averaging about 20 bushels per acre, and at Indian Head from 20 to 25 bushels. The crops on summer-fallowed land are expected to be heavier; but, since they were later in ripening, they are likely to grade somewhat lower.

The prices being paid this year for wheat grading No. 1 and No. 2 Northern are higher than were paid last season for No. 1 Hard. Hence, the farmers in the wheat growing districts of the North-west country are well satisfied with the results of the season.

Although a few days of wet weather have delayed threshing in some quarters, the quantity of wheat handled by the Canadian Pacific Railway and Canadian Northern Railway from September 14 to October 7, and inspected at Winnipeg, was 4,939 cars, aggregating nearly 5,000,000 bushels, and the fine weather which prevailed at the time of leaving Winnipeg would soon greatly accelerate the moving of the crop.

ADDITIONS TO THE STAFF.

During the past year a new division of the work has been established known as the 'Division of Cereal Breeding and Experimentation.' In this are included two important branches of work which hitherto have been under the personal charge of the Director. These are the production of new varieties of cereals by cross-breeding and selection and the comparative tests of new and established sorts. The work of general supervision of all the farms now claims so much of the Director's attention that it was not possible for him to give the time necessary to do justice to these special branches. The great grain growing interests of Canada are so important that every effort should be made to improve existing varieties and to produce such new ones as are needed, by judicious crossing, so that varieties may be had suited to the various climatic conditions found in this country. Much good work has already been done which is creditable to the Department and to the Dominion, but the field is a boundless one and the possibilities of improvement are great. The Experimentalist, who has been appointed to take charge of this division is Dr. C. E. Saunders, who has had special training in this direction and has done considerable work in cross-breeding at the Central Farm during the past seven years.

An assistant has also been appointed to the poultry manager, Mr. Victor Fortier, of St. Jérome, Quebec, having been chosen for this position. Mr. Fortier is a man of much experience in poultry matters, and is specially acquainted with the needs of the province of Quebec in connection with her poultry interests. Through Mr. Fortier's energy and his intimate knowledge of poultry breeding and management it is hoped to extend the usefulness of the poultry division.

PUBLICATIONS ISSUED DURING THE YEAR.

During 1903 three bulletins have been published, No. 41 gave the 'Results obtained in 1902 from trial plots of Grain, Fodder Corn, Field Roots and Potatoes.' This is the eighth bulletin dealing with this subject, prepared by the Director. While dealing primarily with the crops on the experimental plots on all the experimental farms in 1902, it contains also the average results had from the growing of these important farm crops for a series of years. The information thus given has been very useful to the farmers of Canada, showing what varieties have been most productive in different parts of the Dominion.

The second bulletin, No. 42, on 'The Rape Plant, its Culture, use and Value,' was prepared by Mr. J. H. Grisdale, Agriculturist. In this bulletin the usefulness of rape for forage purposes for most classes of stock is demonstrated. The most approved methods of cultivation are given and the cost of growing this crop. Some particulars are also submitted of the results obtained at the Central Experimental Farm in the feeding of this plant to swine and steers.

The third bulletin, No. 43, was on 'Plum Culture, with Descriptions of Varieties,' in which are submitted district lists of plums suitable for Ontario and Quebec. This has been prepared by Mr. W. T. Macoun, Horticulturist, and includes an account of the different classes of plums grown, with some particulars of the experiments which have been carried on with plums at the Central Experimental Farm for many years past. Methods of preparing land for orchard are given, with particulars as to their subsequent planting and care. The methods of propagation of the plum by budding and grafting are referred to and explanations given as to the subsequent pruning and care of the trees; also the spraying of them to control insect enemies and to prevent injuries to which they are liable from various diseases which affect the trees and fruit. Reference is also made to the manner of picking and marketing of the fruit.

PREPARATIONS FOR THE LOUISIANA PURCHASE EXPOSITION AT ST LOUIS.

From each of the experimental farms contributions of material have been made for the Louisiana Purchase Exposition at St. Louis. These consist of large quantities of grain in the straw, as well as of cleaned grain; also collections of grasses, millets and other fodder plants. Large quantities of fruit and vegetables have been put up in bottles in preserving fluids and forwarded to the exhibition branch of the Department of Agriculture. While all have assisted in every department, the largest contributions to the cereal display have come from the experimental farms at Indian Head, N.W.T., Brandon, Manitoba, and from the Central Experimental Farm at Ottawa. The larger portion of the fruit display has been sent from the experimental farms at Agassiz, B.C., Nappan, N.S., and Ottawa, Ont.

ACKNOWLEDGMENTS.

I desire to tender grateful acknowledgments to those who have rendered me special service during the past year. To the United States Department of Agriculture for samples of seeds of cereals, fodder crops and vegetables for test from foreign countries. To the Director of the Royal Gardens, Kew, England, for many sorts of seeds of trees, shrubs and plants from Great Britain and abroad. To the Director of the Arnold Arboretum, Jamaica Plains, Mass., for seeds of many different sorts of trees and shrubs of much interest, from foreign countries. To Prof. John Macoun and Mr. J. M. Macoun, both of the Geological and Natural History Survey of Canada, for much practical information and for seeds of rare Canadian plants.

I also tender my best thanks to the officers of the Central and Branch Experimental Farms, for their faithful services and for their earnest co-operation in carrying out the different branches of the work. My sincere thanks are also due to those members of the staff who have rendered me help in those branches of the work of which I have had personal charge; to Mr. John Fixter, the farm foreman, who has taken special charge of the tests made with fertilizers and taken notes thereon, who has also helped me with practical suggestions; to Mr. George Fixter, to whom I am indebted for careful management of the work connected with the distribution of samples of seed grain to the farmers of Canada; and to Mr. Wm. T. Ellis, who has done much careful work in testing the vitality of seeds, the management of the plants in the greenhouse and in the propagation of many useful species for outside decoration. Mr. Ellis has also rendered useful service in the taking of the Meteorological Records.

I am also pleased to bear testimony to the faithful services of my secretary, Mr. Malcolm C. O'Hanly. The employees also of all the farms have my thanks for the interest they have taken in their work, and the care with which they have discharged their respective duties.

WM. SAUNDERS,
Director of Experimental Farms.

REPORT OF THE AGRICULTURIST.

(J. H. Grisdale, B. Agr.)

Dr. Wm. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith reports upon the horses, cattle, sheep, swine and farming operations under my supervision during the past year.

As in previous years much of my time has been taken up in attending agricultural and live stock meetings in various parts of Canada.

I have to report a fairly successful year in the different branches of my division and in this connection I wish to acknowledge my indebtedness for assistance and earnest co-operation in their various positions of the farm foreman, Mr. John Fixter, of the herdsman, Mr. Chas. Brettell, and of the dairyman, Mr. J. Meilleur.

From December 1, 1902, to November 30, 1903, 3,003 letters were received and 3,339 despatched by the agricultural division.

I have the honour to be, sir,
Your obedient servant,

J. H. GRISDALE,
Agriculturist.

LIVE STOCK.

The live stock now (Dec. 1, 1903) occupying the different stables and pens under my charge includes horses, cattle, sheep and swine.

HORSES.

The horses are used for labour exclusively. They number 19, made up of:—

13 heavy draught horses of Clydesdale and Percheron blood.
5 heavy driving horses.
1 light driver.

CATTLE.

There are representatives of four breeds of cattle, viz.: Shorthorn, Ayrshire, Guernsey and Canadian. There are besides a number of grade cattle and steers.

Pure Bred Breeding Cattle.

The pure bred cattle are as follows:—

11 Shorthorns, including 2 bulls and 9 females.
13 Ayrshires, including 2 bulls and 11 females.
12 Guernseys, including 5 bulls and 7 females.
7 Canadians, including 2 bulls and 5 females.

GRADE CATTLE.

There are 17 grades, including 5 Shorthorn grades, 5 Ayrshire grades, 6 Guernsey grades and 1 Canadian grade.

Steers.

Sixty-seven steers are now being fed in the barns; this includes:—

15 three-year-olds.
21 two-year-olds.
17 yearlings.
14 calves.

SHEEP.

Thirty-four head are in the pens, including 20 Shropshires and 14 Leicesters. The Shropshires are:—

4 rams; 1 old and 3 lambs.
16 ewes; 12 old and 4 lambs.

The Leicesters are:—

3 rams; 1 old and 2 lambs.
11 ewes; 8 old and 3 lambs.

SWINE.

One hundred and eighty-eight pigs of all classes are being fed. This number is made up as follows:—

31 Yorkshire, including
- 12 breeding sows.
- 2 stock boars.
- 3 young sows.
- 8 young boars.
- 6 sucklings.

5 Berkshires, including
- 4 breeding sows.
- 1 young sow.

6 Tamworths—
- 3 breeding sows.
- 3 young sows.

4 Large Blacks.
- 3 breeding sows.
- 1 boar.

142 feeding pigs of various ages and breeds.

HORSES.

There are 19 horses in the stables. These horses are expected to do the work in the various departments during the year. The work on 'The 200 Acre Farm' is but a part of their duties, about 33⅓ per cent of all the work they perform. They work in addition for the horticultural and experimental departments, as well as upon the lawns and in the Arboretum. In addition a large amount of hauling in connection with the different departments as well as roadmaking and messenger service takes up much of their time.

During the 12 months, December 1, 1902, to November 30, 1903, the 19 horses consumed 145,900 lbs. hay (almost 73 tons), 105,432 lbs. oats, bran and oil meal, and 5,000 lbs. roots.

This food was valued at $1,552.10. To care for them cost $560.00, making a total cost of $2,112.10 for 19 head, or $111.16 to feed and care for one horse for the year, or 37 cents per day, counting 300 working days in the year.

The driver received $1.41⅔ per day, hence 10 hours (day's work) work with a team costs $2.16.

In estimating the cost of horse labour further on in this report $2.50 per day is allowed. This leaves a margin of 32 cents per day for wear and tear on harness and for replacing horses as they grow old. Since the daily allowance of 16 cents per horse amounts to $48 in the year of 300 working days, it is evident that all possible contingencies are amply provided for.

Since the stock of horses is 19 head, and the average working life has been about 10 years, there is allowance made for a sinking fund of $9,120 in the ten years, or sufficient to replace the horses and harness twice over.

DAIRY CATTLE.

The herd of dairy cattle during 1903 consisted of 38 females, all told. They were:—

Canadian grades	1
Ayrshires	8
Guernseys	6
Canadians	4
Shorthorn grades	4
Ayrshires grades	6
Guernsey grades	5
Canadian grade	1

FEEDING THE DAIRY CATTLE.

The roughage ration fed to the dairy cows consisted of ensilage, mangels, clover hay and some chaff. The amount of roughage fed varies considerably, since the milch cows vary in weight from 800 lbs. to 1,600 lbs. The approximate roughage ration fed per 1,000 lbs. weight is 35 lbs. corn ensilage, 20 lbs. mangels, 5 lbs. clover hay and a little chaff.

The meal or grain ration fed consisted of different mixtures at different times and to different cows. The meals or grains used were oats, barley, bran, pease, gluten and oil meal. Gluten meal formed the basis of the ration during the winter, while oat chop took its place in summer.

No very heavy grain ration was fed to any cow. A careful study was made of each cow's requirements, and she was fed accordingly.

SUMMER FEEDING.

The cows were, as usual, pastured during the first summer months on part of the fifth year of the rotation; that is, on land from which one year's hay had been cut. In August and September they were allowed to have the clover meadow aftermath of the fourth year of the rotation. In addition, some soiling crops were fed, and some green corn. The meal ration in the summer was a light one. It consisted of oats and barley ground and fed in proportion to the yield of milk, save in the case of heifers with first calves, when a somewhat heavier ration proportionately was fed.

COST OF FEEDING.

In estimating the cost of feeding, the following prices were charged for feed stuffs, being the average local market rates for the same during 1902, save in the case of ensilage and roots, which are charged at the usual values affixed in experimental work:—

	Per month.
Pasture	$ 2 per cow
Bran	16 per ton
Gluten meal and oil meal	25 "
Oats and barley	21 "
Clover hay	7 "
Chaff	4 "
Roots and ensilage	2 "

In estimating the value of the product, 20 cents per pound is allowed for the butter, and 15 cents per hundred pounds for the skim milk and butter milk. The butter is manufactured in the farm dairy and sells on the market at from 22 cents to 30 cents per pound, an average of about 25 cents per pound during the year. This leaves about 5 cents per pound for cost of manufacture.

The following tables give in detail the particulars concerning each cow, herd statements for each of the pure-bred and grade herds, and monthly statements for all the herds combined.

The monthly statements for the whole milking herd show the total yield of milk for each month, its butter fat content, the amount of butter produced, the number of pounds of milk required for a pound of butter, and the average yield of milk per cow per diem. The highest average per cent of fat was recorded in October, and the lowest in February.

In presenting the following 'Herd Reports' some few words of explanation are necessary.

DAIRY CATTLE REPORTS.

During the year 38 different cows were milked for shorter or longer periods, as indicated on the first page of my report on dairy cattle, whereas in the subjoined 'Herd Reports' only 22 animals are reported upon.

In almost any dairy herd of any size some cows will be found that for some reason have given milk during only a very small part of any given year. Where a large number of cows are being considered one or two such cases introduced in estimating the average does not materially affect the same, but where the herds to be compared are small the consideration of one or two such cases in one herd and no such cases in another makes an unjust difference in favour of the latter herd. To overcome this difficulty as far as possible, the records of three of the best cows in each herd, and of cows that had been in milk for the greater part of the year, have been taken, and the averages estimated from these records, rather than from the records of all cows of that particular breed that happened to calve during the year.

Report 1 is a summary of the more important points in connection with the year's work with the dairy herd.

Report 2 contains the individual records of all cows that gave any milk during the year.

Reports 3, 4, 5, 6, 7, 8, 9 and 10 give the herd records of the several pure bred and grade herds under test.

REPORT I.

GENERAL SUMMARY.

—	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Totals.
No. of cows giving milk for month.	23	23	22	20	24	28	32	33	30	28	29	29	
Lbs. of milk in month ..	11,898	11,402	9,838	10,571	15,503	21,263	26,938	25,634	21,932	17,474	18,747	19,282	209,482
Average for 1 day	396·6	367·7	317·3	377·5	500·1	708·8	869	854·4	707·5	563·7	624·9	622	573·9
Daily average per cow.	17·25	16·51	15·13	21·14	23·85	26·58	26·94	25·63	23·08	19·41	20·83	20·30	21·63
Per cent fat.	4·32	4·36	4·35	4·08	4·29	4·29	4·29	4·26	4·24	4·22	4·31	4·40	4·30
Lbs. butter fat...	513·48	497·01	428·02	431·78	665·06	908·04	1154·24	1092·31	929·35	736·63	808·92	849·10	9013·94
Lbs. butter..	604·09	584·73	503·55	507·88	782·42	1068·23	1357·71	1285·07	1093·33	866·59	951·67	998·94	10604·21
Lbs. milk for 1 lb. butter.	19·70	19·49	19·54	20·81	19·82	19·91	19·84	19·95	20·07	20·15	19·69	19·29	19·75

REPORT 2.

Individual Cow Records.

Name of Cows.	Age.	Date of dropping last calf.	Number of days in milk.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds butter produced in year.	Value of butter at 20 cts. per lb.	Value of skim milk at 15 cts. per 100 lbs.	Total value of product.	Amount meal eaten, valued at 1 c. per lb.	Amount of roots and ensilage eaten, valued at $2 per ton.	Amount hay, valued at $7 per ton.	Months on pasture at $2 per month.	Total cost of feed for year.	Cost to produce 100 lbs. milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, skim milk neglected.	Profit on cow during year, labour neglected.
			Days.	Lbs.	Lbs.	p.c.	Lbs.	$	$	$	Lbs.	Lbs.	Lbs.	Mos.	$	Cts.	Cts.	Cts.	$
Queenie ....(G.G.)	5	Mar. 10, '03	290	22·8	6,629	5·93	466·57	93·31	9 24	102 55	1,468	8,430	1,815	5	39 46	59·52	8·4	11·6	63 09
Polly............(G.C.)	8	Jan. 30, '03	325	26·13	8,493	4·55	454·24	90·84	12 04	102 88	1,712	8,290	1,815	5	41 76	49·17	9·4	10·6	61 12
Zamora .... (C.)	7	Apr. 18, '03	320	24·04	7,694	4·96	448·80	89·76	10 80	100 56	1,566	9,455	1,707	5	41 08	53·40	9·1	10·9	59 48
Jessie A......... (A.)	9	Feb. 16, '03	265	35·2	9,330	3·78	415·16	83·03	13 36	96 39	1,729	8,021	1,400	5	40 21	43·09	9·60	10·40	56 18
Laura..........(G.A.)	6	Dec. 12, '02	324	32·3	10,490	3·25	412·80	82·56	15 10	97 66	2,058	6,790	1,630	5	43 77	41·72	10·36	9·64	53 89
Itchen Lady ..... (G.)	6	May 2, '03	290	23·76	6,892	4·85	394·08	78·81	9 73	88 54	1,368	7,700	1,837	5	37 81	54·86	9·6	10·4	50 73
Countess ....(G.A.)	5	Feb. 12, '03	275	31·5	8,674	3·97	405·15	81·03	12 39	93 42	1,769	9,658	1,815	5	43 69	50·36	10·70	9·30	49 73
Bellflower ....(G.G.)	5	Mar. 10, '03	285	25·7	7,339	4·48	387·03	77·40	10 42	87 82	1,484	9,910	1,815	5	41 10	56·00	10·6	9·4	46 72
Fortune .... (C.)	7	Nov. 30, '02	300	21·45	6,436	4·70	356·00	71·20	9 08	80 28	1,542	6,510	1,425	5	36 91	57·34	10·3	9·7	43 37
Maggie .... (A.)	7	Apr. 18, '03	275	27·5	7,562	3·87	344·75	68·95	10 81	79 76	1,293	8,830	1,810	5	38 09	50·37	11·04	8·96	41 67
†Miss Molly..... (S.)	13	Sep. 4, '02	250	25·7	6,429	4·53	330·67	66·01	9 13	75 14	1,339	8,780	1,815	3	34 69	53·96	10·5	9·5	40 45
Marchioness ..... (S.)	9	Mar. 6, '03	300	23·9	7,182	4·14	350·14	70·03	10 25	80 28	1,641	8,800	1,815	5	41 56	57·72	11·9	8·1	38 72
Bloomer .... (A.)	4	Mar. 31, '03	325	21·8	7,087	4·12	343·78	68·75	10 11	78 86	1,625	9,640	1,815	5	42 24	59·60	12·20	7·80	36 62
Flossy Lyons ... (G.)	3	Feb. 4, '03	260	19·39	5,041	5·13	304·54	60·90	9 07	67 99	1,103	6,270	1,767	5	33 48	66·41	10·9	9·1	34 51
Denty.......... (A.)	4	Mar. 29, '03	320	20·36	6,515	4·27	327·05	65·41	9 27	74 68	1,597	9,590	726	5	41 91	64·3	12·8	7·2	32 77
Exile............ (C.)	8	May 10, '03	170	31·12	5,291	3·78	236·52	47·30	7 50	54 80	885	1,070	682	5	22 30	42 14	9·4	10·6	32 50
Deanie .... (G.)	6	Aug. 21, '03	300	18·70	5,631	4·94	327·52	65·46	9 95	83 41	1,394	9,140	1,837	5	41 81	73·18	12·6	7·4	32 10
Bloom...........(G.G.)	9	May 3, '03	290	23·05	6,682	3·96	311·65	62·33	9 55	71 88	1,218	11,310	1,922	5	40 21	60·17	12·92	7·08	31 67
Sadie............(G.S.)	3	Sep. 11, '03	322	18·00	5,799	4·58	312·58	62·51	8 26	70 77	1,373	9,040	1,865	5	39 29	67·75	12·50	7·50	31 48
Annie......... (G.G.)	3	Apr. 1, '03	214	21·63	4,629	4·22	229 72	45·93	6 60	52 55	886	1,120	777	5	22 71	49·06	9·8	10·2	29 84
Flecky .... (A.)	4	Mar. 28, '03	291	21.64	6,299	3·97	294·24	58·84	9 00	64 84	1,498	9,270	633	5	39 78	63·15	13·5	6·5	28 06
Cherry .... (G.S.)	3	July 18, '03	326	18·55	6,047	4·31	306·60	61·32	8 61	69 93	1,744	9,320	1,815	5	43 11	71·20	14·06	5·94	26 82
Alma ....(G.G.)	2	Jan. 19, '03	284	16·33	4,638	4·73	258·78	51·75	6 57	58 32	1,252	5,160	583	5	32 78	70·67	12·6	7·4	25 54
†Honoria........ (G.)	7	Oct. 1, '02	208	21·17	4,425	4·19	229·89	45·97	6 28	52 25	1,182	9,543	720	......	27·66	62·28	12·03	7·97	24 59
Aggie ....(G.G.)	2	Apr. 1, '03	214	17·50	3,747	4·74	209·2	41·84	5 27	47 09	886	5,040	313	5	22 71	60·6	10·8	9·2	24 38
†Darlington Lass. (S.)	10	Apr. 10, '03	180	25·2	4,547	4·17	223·12	44·62	6 48	51 10	813	11,500	1,815	1	28 15	61·90	12·6	7·4	22 95
Alice............(G.A.)	2	Mar. 19, '03	220	20·2	4,449	3·76	197·16	39·43	6 37	45 80	886	2,570	965	5	24 80	55·74	12·60	7·40	21 00
Gurta .... (A.)	3	....	295	18·57	5,479	3·96	255·43	51·08	7 83	58 91	1,242	9,170	726	5	37 94	69·24	16	4	20 97
Alvina .... (G.A.)	2	May 17, '03	167	24·55	3,416	4·08	164	32·80	4 87	37 67	672	120	93	5	17 65	51·7	10·7	9·3	20 02
Dora............(G.A.)	11	Mar. 8, '03	295	22·55	6,645	3·21	251·01	50·20	9 58	59 78	1,656	8,840	726	5	41 75	62 84	16·6	3·4	18 03
Rosy ....(G.S.)	4	Oct. 5, '03	304	18·47	5,615	3·8	251·64	50·32	8 04	58 36	1,448	9,590	746	5	40 59	72·29	16·1	3·9	17 77
Amy ....(G.A.)	2	May 18, '03	165	18·54	2,960	4·28	148·58	29·71	4 21	33 92	660	120	93	5	17 53	59·22	11·8	8·2	16 39

Ruby .... (G.)	6	Oct. 5,'03	283	14·93	4,226	5·68	271·11	54·22	5 92	60 14	1,310	9,685	735	5	49 24	$1·16	18·1	1·9	10 93
Denise Reine .... (C.)	3	....	259	10·09	2,615	4·83	148·7	29·74	3 68	33 42	831	5,390	534	5	28 35	$1·07	19	1	5 07
Clatford Spot .... (G.)	9	Jun. 11,'03	304	12·12	3,687	4·5	199·56	39·91	5 22	42 32	1,617	9,723	735	5	42 32	$1·14	21·2	....	2 81
Illuminata. .... (S.)	4	Mar.21,'03	286	9·6	2,752	4·26	138·05	27·61	3 91	31 52	926	8,645	726	5	34 25	$1·24	24·08	....	*2 73
†Norah's Last.... (A.)	9	Mar.20,'03	92	6·65	612	4·15	29·91	5·98	0 87	6 85	289	6,820	360	.....	12 86	$2·10	43	....	*6 01

†Dead. *Loss.

SHORTHORNS.

Names of Cows.	Age.	Date of dropping last calf.	Number of days in milk in 1903.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds of butter produced in year.	Value of butter at 20c. per lb.	Value of skim milk at 15c. per 100 lbs.	Total value of products.	Amount meal eaten.	Amount of roots and ensilage eaten, valued at $2 per ton	Amount hay, Valued at $7 per ton.	Months on pasture.	Total cost of feed for year.	Costs to produce 100 lbs. of milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, skim milk neglected.	Profit on cow during year, labour neglected.
			Days.	Lbs.	Lbs.	p. c.	Lbs.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Mos	$ cts.	Cts.	Cts.	Cts.	$ cts.
Marchioness..	9	Mar. 6, 03	300	23·9	7,182	4·14	350·14	70 03	10 25	80 28	1,641	8,800	1,815	5	41 56	57·72	11·9	8·1	38 72
Miss Molly.............	13	Sept. 4, 02	250	25·7	6,429	4·53	330·07	66 01	9 13	75 14	1,339	8,780	1,815	3	34 69	53·96	10·5	9·5	40 45
Darlington Lass..........	10	Apr. 10, 03	180	25·2	4,547	4·17	223·12	44 62	6 48	51 10	813	11,500	1,815	1	28 15	61·90	12.6	7·4	22 95
Average.	....	....	243	24·9	6,053	4·22	301·11	60 22	8 62	68 84	1,294	9,693	1,815	3	34 80	57·49	11·56	8·44	34 04
AYRSHIRES.																			
Jessie A................	9	Feb. 16, 03	265	35·2	9,330	3·78	415·16	83 03	13 36	96 39	1,729	8,021	1,400	5	40 21	43·09	9·60	10·40	56 18
Maggie.....	7	Apr. 18, 03	275	27·5	7,562	3·87	344·75	68 95	10 81	79 76	1,293	8,830	1,810	5	38 09	50·37	11·04	8·96	41 67
Bloomer.	4	Mar. 31, 03	325	21·8	7,087	4·12	343·78	68 75	10 11	78 86	1,625	9,640	1,815	5	42 24	59·60	12·20	7·80	36 62
Average............	....	....	288	27·7	7,993	3·91	367·89	73 57	11 42	85 00	1,549	8,830	1,675	5	40 18	50·26	10·92	9·08	44 82
GUERNSEYS.																			
Itchen Lady............	6	May 2, 03	290	23·76	6,892	4·85	394·08	78 81	9 73	88 54	1,368	7,700	1,837	5	37 81	54·86	9·6	10·4	50 73
Deanie.................	6	Aug.21, 03	300	18·70	5,631	4·94	327·32	65 46	7 95	73 41	1,574	9,140	1,837	5	41 31	73·18	12·6	7·4	32 10
*Flossy Lyons........ .	3	Feb. 4, 03	260	19·39	5,041	5·13	304·54	60 90	7 09	67 99	1,103	6,270	1,767	5	33 48	66·41	10·9	9·1	34 51
Average..........	....	....	283	20·7	5,855	4·96	341·98	68 39	8 25	76 64	1,348	7,702	1,813	5	37 53	64·09	10·9	9·1	42 45

* Flossy Lyons calved for first time in February, 1903.

CANADIANS.

Names of Cows.	Age.	Date of Dropping last calf.	Number of days in milk in 1903.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds of butter produced in year.	Value of butter at 20c. per lb.	Value of skim milk at 15c. per 100 lbs.	Total value of products.	Amount meal eaten.	Amount of roots and ensilage eaten valued at $2 per ton.	Amount hay valued at $7 per ton.	Months on pasture.	Total cost of feed for year.	Cost to produce 100 lbs. milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, skim milk neglected.	Profit on cow during year, cost of labour not included.
			Days.	Lbs.	Lbs.	p. c.	Lbs.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Mos	$ cts.	Cts.	Cts.	Cts.	$ cts.
Zamora	7	Apr. 18, '03	320	24·04	7,694	4·96	448·80	89 76	10·80	100·56	1,566	9,455	1,707	5	41 08	53·40	9·1	10·9	59·48
Fortune	7	May 10, '03	300	21·45	6,436	4·70	356·00	71 20	9·08	80·28	1,542	6,510	1,425	5	36 91	57·34	10·3	9·7	43·37
* Exilee	8	Nov. 30, '02	170	31·12	5,291	3·78	236·52	47 30	7·50	54·80	885	1,070	682	5	22 30	42·14	9·4	10·6	32·50
Average	....	....	263	24·48	6,440	4·58	347·10	69 42	9·12	78·54	1,331	5,678	1,271	5	33 43	51·90	9·6	10·4	45·12

* Exilee was purchased in March and gave no milk till May 10, 1903, when she calved.

SHORTHORN GRADES.

Names of Cows.	Age.	Date of Dropping last calf.	Number of days in milk in 1903.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds of butter produced in year.	Value of butter at 20c. per lb.	Value of skim milk at 15c. per 100 lbs.	Total value of products.	Amount meal eaten.	Amount of roots and ensilage eaten valued at $2 per ton.	Amount hay valued at $7 per ton.	Months on pasture.	Total cost of feed for year.	Cost to produce 100 lbs. milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, skim milk neglected.	Profit on cow during year, cost of labour not included.
Bloom	9	May 3, '03	290	23·05	66·82	3·96	311·65	62 33	9 55	71 88	1,218	11,310	1,922	5	40 21	60·17	12·92	7·08	31·67
Sadie	3	Sept. 11, '03	322	18·00	57·99	4·58	312·58	62 51	8 26	70 77	1,373	9,040	1,865	5	39 29	67·75	12·50	7·50	31·48
Cherry	3	July 18, '03	326	18·55	60·47	4·31	306·60	61 32	8 61	69 93	1,744	9,320	1,815	5	43 11	71·20	14·06	5·94	26·82
Average	...	....	312	19·79	61·76	4·27	310·27	62 05	8 80	70 86	1,445	9,890	1,867	5	40 87	66·15	13·17	6·83	29·99

AYRSHIRE GRADES.

Names of Cows.	Age.	Date of Dropping last calf.	Number of days in milk in 1903.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds of butter produced in year.	Value of butter at 20c. per lb.	Value of skim milk at 15c. per 100 lbs.	Total value of products.	Amount meal eaten.	Amount of roots and ensilage eaten valued at $2 per ton.	Amount hay valued at $7 per ton.	Months on pasture.	Total cost of feed for year.	Cost to produce 100 lbs. milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, skim milk neglected.	Profit on cow during year, cost of labour not included.
Laura	6	Dec. 12, '02	324	32·3	10,490	3·35	412·80	82·56	15 10	97 66	2,058	6,790	1,630	5	43 77	41·72	10·36	9·64	53·89
Countess	5	Feb. 12, '03	275	31·5	8,674	3·97	405·15	81·03	12 39	93 42	1,769	9,658	1,815	5	43 69	50·36	10·70	9·30	49·73
Alice	2	Mar. 19, '03	220	20·2	4,449	3·76	197·16	39·43	6 37	[illegible]	886	2,570	965	5	24 80	55·74	12·60	7·40	21·00
Average	...	....	273	28·8	7,871	3·65	338·37	67·67	11 28	78 96	1,571	6,339	1,470	5	37 43	47·54	11·05	8·95	41·54

Imported Ayrshire Herd at Central Experimental Farm.

GUERNSEY GRADES.

Names of Cows.	Age.	Date of dropping last calf.	Number of days in milk in 1903.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds of butter produced in year.	Value of butter at 20c. per lb.	Value of skim milk at 15c. per 100 lbs.	Total value of products.	Amount meal eaten.	Amount of roots and ensilage eaten, valued at $2 per ton.	Amount hay, valued at $7 per ton.	Months on pasture.	Total cost of feed for year.	Cost to produce 100 lbs. of milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, skim milk neglected.	Profit on cow during year, labour neglected.
			Days.	Lbs.	Lbs.	p.c.	Lbs.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Mos	$ cts.	Cts.	Cts.	Cts.	$ cts.
Queenie........	5	Mar. 10, 03	290	22·8	6,629	5·93	466·57	93 31	9 24	102 55	1,468	8,430	1,815	5	39 46	59·52	8·4	11·6	63·09
Bellflower........	5	Mar. 10, 03	285	25·7	7,339	4·48	387·03	77 40	10 42	87 82	1,484	9,910	1,815	5	41 10	56 00	10·6	9·4	46·72
* Annie	3	Apr. 1, 03	214	21·63	4,629	4·22	229·72	45 95	6 60	52 55	886	1,120	777	5	22 71	49·06	9·8	10·2	29·84
Average..........	....	....	263	23·2	6,199	4·95	361·11	72 22	8 75	80 97	1,279	6,153	1,369	5	34 42	55·51	9·5	10·5	46·55

* Annie calved for first time April 1, 1903.

CANADIAN GRADE.

Names of Cows.	Age.	Date of dropping last calf.	Number of days in milk in 1903.	Daily average yield of milk.	Total milk for year.	Per cent of fat in milk.	Pounds of butter produced in year.	Value of butter at 20c. per lb.	Value of skim milk at 15c. per 100 lbs.	Total value of products.	Amount meal eaten.	Amount of roots and ensilage eaten, valued at $2 per ton.	Amount hay, valued at $7 per ton.	Months on pasture.	Total cost of feed for year.	Cost to produce 100 lbs. of milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, skim milk neglected.	Profit on cow during year, labour neglected.
Polly	8	Jan. 30, 03	325	26·13	8,493	4·55	454 24	90 84	12 04	102 88	1,712	8,290	1,815	5	41·76	49 17	9·4	10·6	61·12

DAILY RECORDS.

The effort to interest dairymen in the returns from their individual cows has been continued, and many farmers seem to be awakening to a knowledge of the fact that the improvement of the whole herd demands the study of the unit; that is, a close acquaintance with the expenditure upon the individual cow and the returns from the same.

This can be determined in no other way than by keeping an exact record of the daily milk yield and the daily food consumption.

Forms, similar to the following, for keeping a record of the milk yield are still supplied free on application.

DAILY MILK RECORD.

Herd belonging to...
Post Office...
Record for week ending...

(This form supplied free by Live Stock Division, Central Experimental Farm, Ottawa, Ont.)

COWS.

Day.	Time.																	Total for Day.
Sunday...........	Morning......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....
	Evening......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....
Monday............	Morning......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....
	Evening......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....
Tuesday...........	Morning......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....
	Evening......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....
Wednesday.........	Morning......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....
	Evening......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....
Thursday..........	Morning......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....
	Evening......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....
Friday............	Morning......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....
	Evening......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....
Saturday..........	Morning......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....
	Evening......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....
Total......	Week.........	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	....

(Reverse.)

CENTRAL EXPERIMENTAL FARM.

WM. SAUNDERS, *Director*. J. H. GRISDALE, *Live Stock and Agriculture.*

MILK RECORDS.

1. The profitable dairy cow must give over 5,000 pounds of milk each year. To know the value of a cow her total annual yield of milk must be known. The only way to know this is to keep a record of her daily milk yield.

2. The form on the other side of this sheet is intended to help progressive dairy farmers by supplying them with a simple and convenient sheet for the keeping of the milk records of their individual cows. A study of such records will soon indicate which cows should go to the butcher. We would be pleased to receive a summary of your record. If you have no summary forms write us.

3. Such records are being kept by hundreds of successful dairymen to-day. Many of these men attribute their success to the keeping of such records. Why not give the thing a trial if you are a dairyman ? It will increase your milk product. It will lighten your labour, since your interest will be increased in your work, and 'interest lightens

labour.' It will show you the unprofitable cow the 'boarder.' You cannot get rid of her too quickly.

4. For weighing the milk a simple spring balance may be secured for from one to three dollars. If your local dealer cannot supply you, write the undersigned for particulars. A small platform scale is fairly convenient, but we find the spring balance preferable.

5. Many farmers keep records of the amount of food fed to individual cows. If you would like to do so, sample forms would be sent free on writing J. H. Grisdale, Agriculturist, Central Exeprimental Farm, Ottawa, Ont.

BEEF PRODUCTION.

EXPERIMENTS IN 1902-3.

The experiments in the winter of 1902-3 have been similar to those in 1901-2. The prices charged for feeds are the same as those mentioned in connection with feeding dairy cows.

It will be observed that in every case where steers were bought in for feeding purposes in 1902-3 there was a loss. In 1901-2 the difference between the cost price when steers were bought in for feeding in the fall and the selling price when they were sold out fat the next spring was nearly double the cost of the feed required to fatten them. In 1902-3 the difference between the buying price and the selling price falls short of the cost of feed at the prices charged.

As stated in my report for 1902, such favourable conditions as maintained in 1901-2 for the beef producer seldom occur. I think I may just as safely say now that such disastrous years as 1902-3 for the feeder are seldom seen. Throughout Canada and the United States cattle bought in the fall of 1902 for feeding left a very small margin to pay for feed and care. Judging by the prices paid for feeding cattle and the market prices for prime beef in the spring, I am certain that an average of $15 per head increase in value is the outside. Such a sum is considerably short of sufficient to pay all expenses let alone leave any profit.

Of course, it must not be forgotten that a large part of the food consumed would be roughage of such a character that it could not be sold off the farm, and, in addition, the manure obtained from cattle fed would be a most valuable and really indispensable by-product of all such feeding operations.

LOOSE *vs.* TIED.

The feeding of steers loose as contrasted with similar steers fed tied has been continued during the past year, and, as was the case last year, the scope of the experiment slightly enlarged to include the comparison of steers fed loose allowed a large area of floor space with similar steers fed loose allowed a more limited area of floor space.

The steers fed tied occupied 56 square feet of floor space each; one lot fed loose occupied 84 square feet of floor space for each steer, while another lot fed loose occupied only 38 square feet of floor space for each steer.

In 1901-2 both lots fed loose made greater and more economical gains that did the lot fed tied, the lot having the smaller floor space making the greatest gains of the three.

To compare :—

LOTS FED IN 1902-3.

Lot 1.—Tied, 9 steers, 56 sq. ft. per steer, average gain, 284 pounds in 180 days, or 1·58 pounds per steer per day.

Lot 2.—Loose, 9 steers, 84 sq. ft. per steer, average gain, 337 pounds in 180 days, or 1·87 pounds per steer per day.

Lot 3.—Loose, 9 steers, 38 sq. ft. per steer, average gain 274 pounds in 180 days, or 1·52 pounds per steer per day.

A combining of the results of 1902 with those of 1903 shows a somewhat different standing, as follows:—

Lot 1.—Tied, 9 steers, 56 sq. ft. per steer, average gain 591 pounds in 366 days, or 1·62 pounds per steer per day.

Lot 2.—Loose, 9 steers, 84 sq. ft. per steer, average gain, 666 pounds in 366 days, or 1·82 pounds per steer per day.

Lot 3.—Loose, 9 steers, 38 sq. ft. per steer, average gain, 619 pounds in 366 days, or 1·69 pounds per steer per day.

Below are detailed statements of the different lots discussed, which were fed in the winter of 1902-3.

LOT 'A.'

TIED (3 YEARS OLD, NOT DEHORNED).

Each steer occupied 56 square feet floor space.

Number of steers in lot	9	
First weight gross	11,420	lbs.
First weight average	1,269	"
Finished weight gross	13,980	"
Finished weight average	1,553	"
Total gain in 180 days	2,560	"
Average gain per steer	284	"
Daily gain for lot, 9 steers	14·22	"
Daily gain per steer	1·58	"
Gross cost of feed	$180 69	
Cost of 100 pounds gain	7 05	
Cost of steers, 11,420 lbs. at $4.90 per 100 lbs.	559 58	
Total cost to produce beef, $559.58+$180.69	740 27	
Sold, 13,980 lbs. at $5.25 per 100 lbs., less 5 per cent	697 25	
*Loss on lot	43 02	
Net loss per steer	4 78	
Average buying price per steer	62 17	
Average selling price per steer	77 47	
Average increase in value	15 30	
Average cost of feed per steer	20 08	
Amount of meal (Gluten meal) eaten by lot of 9 steers	4,815	lbs.
Amount of ensilage and roots	90,719	"
Amount of hay	8,514	"

LOT 'B.'

LOOSE (3 YEARS OLD, DEHORNED.)

Each steer allowed 84 feet floor space.

Number of steers in lot	9	
First weight gross	8,950	lbs.
First weight average	994	"
Finished weight gross	11,985	"

Finished weight average	1,331 "
Total gain in 180 days	3,035 "
Average gain per steer	337 "
Daily gain for lot, 9 steers	16·86 "
Daily gain per steer	1·87 "
Gross cost of feed	$161 62
Cost of 100 lbs. gain	5 32
Cost of steers, 8,950 lbs. at $4.90 per 100 lbs,	438 55
Total cost to produce beef, $438.55+$161.52	600 17
Sold, 11,985 lbs. at $5.25 per 100 lbs., less 5 per cent	577 77
*Loss on lot	22 40
Net loss per steer	2 49
Average buying price per steer	48 73
Average selling price per steer	64 19
Average increase in value	15 46
Average cost of feed per steer	17 95
Amount of meal (Gluten meal) eaten by lot of 9 steers	4,086 lbs.
Amount of ensilage and roots	81,537 "
Amount of hay	8,239 "

LOT 'C.'

LOOSE (3 YEARS OLD, DEHORNED).

Each steer allowed 38 square feet floor space.

Number of steers in lot	9
First weight gross	8,955 lbs.
First weight average	995 "
Finished weight average	1,269 "
Finished weight gross	11,425 "
Total gain in 180 days	2,471 "
Average gain per steer	274 "
Daily gain for lot, 9 steers	13·73 "
Daily gain per steer	1·52 "
Gross cost of feed	$161 62
Cost of 100 pounds gain	6 58
Cost of steers, 8,955 lbs. at $4.90 per 100 lbs.	438 79
Total cost to produce beef, $438.79+$161.62	600 41
Sold, 11,425 lbs. at $5.25 per 100 lbs., less 5 per cent	569 34
*Loss on lot	31 07
Net loss per steer	3 45
Average buying price per steer	48 75
Average selling price per steer	63 26
Average increase in value	14 51
Average cost of feed per steer	17 95
Amount of meal (Gluten meal) eaten by lot of 9 steers	4,086 lbs.
Amount of ensilage and roots	81,537 "
Amount of hay	8,289 "

*In each case where a loss is apparent, it is understood that had all foods been bought at prices indicated then there would have been an actual loss. In the case of lot 'A' for instance, where a loss of $43.02 on 9 steers, or $4.78 on each steer of the lot is indicated, the actual money outlay was $60.19, the balance of the estimated cost of feeding the 9 steers being the value placed upon the ensilage or roots and the hay.

INFLUENCE OF AGE ON COST OF BEEF.

COST OF PRODUCING BEEF WITH

Three-year-olds, Two-year-olds, Yearlings, Six Months' Calves and New-born Calves.

The experiments to gain some data as to the influence of age upon the cost of producing a pound of beef have been continued.

Lots of animals of as nearly uniform type and breeding as possible were selected and fed such rations as were found to suit them best. The roughage ration in each case consisted of roots, ensilage and hay, the concentrates fed to 3-year-olds, 2-year-olds, and yearlings was gluten meal. The calves were fed a meal ration made up of oats, pease, barley, oil meal and gluten mixed in different proportions at different periods.

Full statements of the particulars in connection with each lot will be found below. A few of the more important particulars are grouped for comparison as follows:—

Ages.	Daily Gain.	Gain in 180 days.	Cost 100 lbs. Gain.
	Lbs.	Lbs.	$
Three Year Olds	1·58	284	7.05
Two Year Olds	1·65	298	6.03
Yearlings	1·65	298	5.54
Six Month Calves	1·46	263	5.33
Skim Milk Calves, New Born	1·48	273	2.16

In cost of production there is a quite remarkable gradation in favour of the younger classes.

LOT 'D'—THREE-YEAR-OLDS.

Number of steers in lot	9	
First weight, gross	11,420	lbs.
First weight, average	1,269	"
Finished weight, gross	13,980	"
Finished weight, average	1,553	"
Total gain in 180 days	2,560	"
Average gain per steer	284	"
Daily gain for lot, 9 steers	14·22	"
Daily gain per steer	1·58	"
Gross cost of feed	$ 180 69	
Cost of 100 pounds gain	7 05	
Cost of steers, 11,420 lbs. at $4.90 per 100 lbs.	559 58	
Total cost to produce beef, $559.58 + $180.69	740 27	
Sold, 13,980 lbs. at $5.25 per 100 lbs., less 5 per cent	697 25	
Loss on lot	43 02	
Net loss per steer	4 78	
Average buying price per steer	62 17	
Average selling price per steer	77 47	
Average increase in value	15 30	
Average cost of feed per steer	20 08	

Amount of meal (gluten meal) eaten by lot of 9 steers....	4,815 lbs.
Amount of ensilage and roots....	90,719 "
Amount of hay....	8,514 "

LOT 'E'—TWO-YEAR-OLDS.

Number of steers in lot..	9
First weight gross....	9,775 lbs.
First weight average....	1,079 "
Finished weight gross......	12,395 "
Finished weight average....	1,377 "
Total gain in 180 days....	2,680 "
Average gain per steer....	298 "
Daily gain for lot, 9 steers....	14·89 "
Daily gain per steer....	1·65 "
Gross cost of feed....	$161 62
Cost of 100 pounds gain..	6 03
Cost of steers, 9,775 pounds at $4.90 per 100 pounds..	479 97
Total cost to produce beef, $447.49+$161.59..	651 59
Sold, 12,395 pounds at $5.25 per 100 pounds, less 5 per cent..	618 24
Loss on lot..	33 35
Net loss per steer..	3 70
Average buying price per steer..	53 33
Average selling price per steer..	68 69
Average increase in value..	15 36
Average cost of feed per steer..	17 95
Amount of meal (gluten meal) eaten by lot of 9 steers.....	4,086 lbs.
Amount of ensilage and roots......	81,537 "
Amount of hay....	8,289 "

LOT 'F'—YEARLINGS.

Number of sters in lot..	9
First weight gross......	8,685 lbs.
First weight average.......	965 "
Finished weight gross....	11,370 "
Finished weight average......	1,263 "
Total gain in 180 days....	2,685 "
Average gain per steer....	298 "
Daily gain for lot, 9 steers......	14·90 "
Daily gain per steer.......	1·65 "
Gross cost of feed....	$148 97
Cost of 100 pounds gain..	5 54
Cost of steers, 9,685 pounds at $4.90 per 100 pounds..	474 56
Total cost to produce beef, $474.56 + $148.97..	623 53
Sold, 11,370 pounds at $5.25 per 100 pounds, less 5 per cent..	596 92
Loss on lot..	26 61
Net loss per steer..	2 95
Average buying price per steer..	52 73
Average selling price per steer..	66 10
Average increase in value..	13 37
Average cost of feed per steer..	16 55
Amount of meal (gluten meal) eaten by lot of 9 steers..	3,649 lbs.
Amount of ensilage and roots....	74,349 "
Amount of hay....	8,289 "

LOT 'G.'—CALVES (6 MONTHS' OLD).

Number of steers in lot	6
First weight gross	2,290 lbs.
First weight average	382 "
Finished weight gross	3,870 "
Finished weight average	645 "
Total gain in 186 days	1,580 "
Average gain per steer	263 "
Daily gain for lot, 6 steers	8·77 "
Daily gain per steer	1·46 "
Gross cost of feed	$ 84 17
Average cost of feed per steer	14 03
Amount of meal (oats, pease, barley and oil meal) eaten by lot of 6 steers	4,070 lbs.
Amount of ensilage and roots	32,316 "
Amount of hay	2,016 "

LOT 'H.'—SKIM MILK CALVES (NEW BORN.).

Number of steers in lot	6
First weight gross	791 lbs.
First weight average	113 "
Last weight gross	2,702 "
Last weight average	386 "
Total gain in 184 days	1,911 "
Average gain per steer	273 "
Daily gain for lot, 7 steer	10·36 "
Daily gain per steer	1·48 "
Gross cost of feed	$ 41 34
Amount of meal (oats, pease, barley and oil meal) eaten by lot of 7 steers	2,020 lbs.
Amount of ensilage and roots	5,558 "
Amount of hay	420 "
Amount of skim milk	9,485 "

BABY BEEF *vs.* LONG FEED BEEF

Since May, 1900, an experiment has been carried on having for aim the securing of information as to comparative costs and profits of producing beef, (1) by feeding a heavy ration from birth to block, and (2) by feeding in the usual way, that is, giving only a limited growing ration from birth till five or six months before it is desired to slaughter.

The two lots started in 1901 as well as the two started in 1900 have been sold, and therefore, the whole four lots are reported upon below. The important findings are arranged to facilitate comparison below. Since averages of work with a number of steers is always more interesting and more valuable as a guide than findings from single steers, each column means the average of 5 steers, save in the columns headed 'Average,' one under 'Baby Beef' and one under 'Long Feed Beef,' each of which

so named columns is the average of ten steers fed as indicated by the heading 'Baby Beef' or 'Long Feed Beef.'

Particulars for comparison (1 steer considered always).	Baby Beef.			Long Feed Beef.		
	1900. Lot of 5 steers.	1901. Lot of 5 steers.	Average of 10 steers.	Average of 10 steers.	1901. Lot of 5 steers.	1900. Lot of 5 steers.
	Lbs.	Lbs.	Lbs,	Lbs.	Lbs.	Lbs.
Number of days on feed..	670	730	700	913	730	1,095
Weight when put on experiment	150	95	122½	107	95	119
" " slaughtered............	1,300	1,295	1,297½	1,235	1,100	1,370
Gain during feeding period...........	1,150	1,200	1,175	1,128	1,005	1,251
Daily rate of gain	1·72	1·64	1·68	1·26	1·37	1·14
Amount meal eaten.	3,018½	4,600	3,809	1,405	1,057	1,752
" roots and ensilage eaten......	15,852	15,755	15,793	19,529	14,212	24,846
" hay eaten.,..................	1,096	1,213½	1,150	1,315	786	1,843
" straw.	....	....	....	....	....	112
" skim milk....................	1,505	1,755	1,645	1,592	1,679	1,505
" pasture................	....	....	....	9 mos.	6 mos.	12 mos.
" rape..........	....	740	70	....	....	....
Cost of feed from birth to block........	$54 28	$71 85	$63 06	$59 66	$43 53	$75 80
" 100 lbs. increase live weight....	4 72	5 98	5 35	5 29	4 33	6 06½
Sold for per 100 lbs. live weight.......	5 75	5 50	5 62½	4 78	4 50	5 25

The following table shows the amount of each kind of meal or other food consumed by the average steer in each lot from birth to block and the valuation put upon the different kinds of food in estimating the cost of production.

Lot.	Skim Milk.	Gluten.	Oil Meal.	Calf Meal	Oats.	Barley.	Pease.	Bran.	Shorts.	Corn.	Roots.	Ensilage.	Hay.	Pasture.	Rape.
1900.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.		Lbs.
Fattening	1505	905	392	....	620	....	....	610	....	491	4775	11077	1096		
1901.															
Fattening.........	1784	1102	315½	18	2427½	....	14	518	10½	194	4970	10785	1213½	....	140
1900.															
Limited	1505	752½	171½	....	281½	17½	....	299½	117½	....	9009	15837	1843	12 mos.	
1901.															
Limited	1679	405½	131½	....	178½	....	....	252	89½	....	4893	9319	786	6 mos.	
Price charged per 100 lbs ....$	0 15	1 25	1 33½	2 20	1 00	1 00	1 25	0 75	0 98	1 25	0 10	0 10	0 35	$2 per m.	0 10

This line of work is being continued and below are reports up to date upon the steers now under experiment.

YEARLINGS.

The lots started out in May, 1902, are as follows:—

FULL FATTENING RATION.

Calves Dropped in 1902.

Number of steers in lot	6
First weight, gross, November 1, 1902	2,290 lbs.
First weight average, November 1, 1902	381 "
Last weight, gross, November 1, 1903	4,875 "
Last weight, average, November 1, 1903	812½ "
Total gain in 165 days	2,585 "
Average gain per steer	431 "
Daily gain per steer	1·18 "
Gross cost of feed	$ 157 54
Cost of 100 pounds gain	6 13
Average cost of feed per steer	26 26
Amount of meal eaten by lot of 6 steers	5,382 lbs.
Amount of ensilage and roots	33,526 "
Amount of hay	7,098 "
Each steer was on pasture	3 mos.

One steer consumed in 365 days:—

Gluten meal, 274½ lbs; calf meal, 66½ lbs.; oil meal, 62 lbs; oats, 462½ lbs.; bran, 31½ lbs.; roots, 2,659 lbs.; ensilage, 2,929 lbs.; hay, 1,183 lbs.; pasture, 3 months.

LIMITED GROWING RATION LOT.

Calves Dropped 1902.

Number of steers in lot	6
First weight gross, November 1, 1902	2,065 lbs.
First weight average, November 1, 1902	344 "
Last weight gross, November 1, 1903	4,165 "
Last weight average	694 "
Total gain in 365 days	2,100 "
Average gain per steer	350 "
Daily gain per steer	0·96 "
Gross cost of feed	$ 130 67
Cost of 100 pounds gain	6 22
Average cost of feed per steer	21 78
Amount of meal eaten by lot of 6 steers	525 lbs.
Amount of ensilage and roots	43,470 "
Amount of hay	2,880 "
Each steer was on pasture	6 mos.

One steer consumed in 365 days :—

Gluten meal, 24½ lbs.; oats, 63 lbs.; roots, 3,470 lbs.; ensilage, 3,775 lbs.; hay, 480 lbs.; pasture, 6 months.

CALVES.

The calves from birth till about six months old are fed quite similar rations and make similar gains; therefore only one lot is reported upon

FULL FATTENING RATION LOT.

Calves Dropped April, 1903.

Number of steers in lot	5	
First weight gross	565	lbs.
First weight average	113	"
Last weight gross	1,930	"
Last weight average	386	"
Total gain in 184 days	1,365	"
Average gain per stweer	273	"
Daily gain per steer	1·48	"
Gross cost of feed	$ 29 53	
Cost of 100 pounds gain	2 16	
Average cost of feed per steer	5 90⅗	
Average gain per steer	273	"
Amount of meal eaten by lot of 5 steers	1,442½	lbs.
Amount of ensilage and roots	3,970	"
Amount of hay	300	"
Amount of skim milk	6,775	"
On pasture	1 mo.	

One calf consumed in 184 days :—

Shorts, 22½ lbs.; oats, 134 lbs.; bran, 74 lbs.; oil meal, 58 lbs.; ensilage or green feed, 794 lbs.; skim milk, 1,355 lbs.; hay, 64 lbs.; pasture, 1 month in day time.

CROP ON 200-ACRE FARM.

Up to the present no concise summary of the crops upon the 200-acre farm each year has been published. Such a summary of the crop each year for the last five years, 1899 to 1903 inclusive, would no doubt be interesting to many, and is accordingly submitted herewith.

COMPARATIVE Statement of Crops on '200 Acre Farm' from 1899 to 1903, inclusive—(200 Acre Farm includes 7 Acres of Roads).

Year.	Grain.		Hay.		Roots and Corn.		Pasture.		Soiling Crop.		Pig Pasture.		Remarks.
	Area in Acres.	Yield in Pounds.	Area in Acres.	Yield in Tons.	Area in Acres.	Yield in Tons.	Area in Acres.	Number of Cattle.	Area in Acres.	Disposition of Crops.	Area in Acres.	Crops Grown for Pasture.	
1899	73	118,466	39	93	40	326½	40	36	1	Fed to dairy cows	....	....	Generally considered a good year for all crops.
1900	80	126,621	53	138	40	743	20 and aftermath	49	....	....	....	....	Season very favourable for most crops.
1901	79	114,472	58	210	40	702	16 and aftermath	52	....	....	....	....	Season very favourable for most crops.
1902	74	144,914	60	216	39	665	20 and aftermath	62	....	....	5	Clover, rape and aftermath.	Season favourable for hay, bad for corn.
1903	69	126,619	62	154	34	473	16 and aftermath	96	5	Dairy cows, bulls and calves.	6	Clover and rape.	Season very unfavourable for most crops, particularly adverse to corn and roots. No second crop hay.

The variety of crops grown and the varying areas under each crop each year make it quite difficult to make a comparison of the returns of the different years, so to simplify matters I would suggest that a fixed valuation be put upon the products and the returns of each year valued accordingly.

Fixing prices as follows: Grain, $1 per 100 lbs.; roots and ensilage, $2 per ton; hay, $7 per ton; pasturing cattle, $8 per season; and area under pigs, $15 per acre; the returns from the '200 Acre Farm' for the years mentioned may be said to have been worth $2,776.66 in 1899; $4,110.21 in 1900; $4,434.72 in 1901; $4,787.14 in 1902; $4,148.19 in 1903.

UTILIZATION OF FEED.

An examination into the supply of feed produced on the 200-acre farm, the experimental plots of roots and corn, and the meal or grain purchased for use in the barns, together with a detailed statement of the disposal thereof and a statement of the kinds of grain and meal consumed from July 1, 1902, to June 30, 1903, follows:—

SUMMARY of Feed of all kinds used in connection with Stock on 200 Acre Farm from July 1, 1902, to June 30, 1903.

——	Grain or Meal.	Roots and Ensilage.	Hay
	Lbs.	Lbs.	Lbs.
Grown on 200 Acre Farm (Crop of 1902)	144,914	1,330,000	432,000
Received from Experimental Dep't	....	294,000	
Purchased	209,730	....	
Total	354,644	1,624,000	432,000
Value	$3,546.44	$1,624.00	$1,512.00

DISPOSITION of Feed harvested on, and bought for use of Live Stock on 200 Acre Farm.

Class Fed.	Hay.	Grain and Meal.	Corn and Roots.	
	Lbs.	Lbs.	Lbs.	
19 horses	145,900	105,432	5,000	Hay weighed at intervals and amount calculated. All grain and meal weighed. Roots estimated.
94 steers	69,429	45,909	661,085	All feeds weighed.
37 milch cows, all breeds	65,585	47,837	322,696	All feeds weighed.
47 young stock and bulls, all breeds	65,999	21,646	240,252	Partly weighed and estimated from said weighings.
64 sheep	19,500	3,590	4,000	Meal weighed. Hay and roots estimated.
425 swine	....	97,904	46,500	Meal weighed. Roots partly weighed, balance estimated from weighings.
Loss by experimental curing	10,000	....		
On hand, July 1, 1903	20,000	9,500		
Total accounted for	396,413	331,818	1,279,533	
Am't harvested and received	432,000	354,644	1,624,000	
Shrinkage	35,587	22,826	344,467	
Percentage shrinkage	8·24%	6·43%	21·21%	

The meal consumed consisted of oats, 148,782 lbs.; barley, 10,919 lbs.; bran, 45,281 lbs.; oil meal 13,879 lbs.; glutten meal, 43,755 lbs.; pease, 3,110 lbs.; shorts, 50,779 lbs.; mixed crop (oats, pease, barley), 14,073 lbs.; feed flour, 700 lbs. Total. 331,818 lbs.

BALANCE SHEET OR FINANCIAL STATEMENT OF LIVE STOCK FEEDING OPERATIONS ON 200 ACRE FARM, JULY 1, 1902, TO JUNE 30, 1903.

In compiling the following table, the figures in the columns headed 'Value' in both 1902 and 1903 represent either the cost price of the animals included, where recently bought or the fair merchantable price of the same at the date of valuation.

Under the heading 'Returns' are included values of products and services during the year.

In the case of horses the services of the 19 head are valued at $3,061.80, but since the labour of six horses is required to do the work on the 200 acre farm, only $2,041.20 or two-thirds of the value of their labour is credited to them.

COMPARATIVE STATEMENTS.

—	July 1, 1902.		July 30, 1903.			Gross returns made up of increase in value, value of products and animals sold.
	Number on hand.	Value.	Number on hand.	Value.	Returns.	
		$ cts.		$ cts.	$ cts.	$ cts.
Horses	19	....	19	....	2,041 20	2,041 20
Shorthorns— Pure bred and grade	16	2,155 00	20	3,410 00	627 77	1,882 77
Ayrshires— Pure bred and grade	21	1,650 00	30	2.410 00	911 80	1,671 80
Guernseys— Pure bred and grade	17	1,516 00	23	1,956 00	804 40	1,244 40
Canadians— Pure bred and grade	6	725 00	9	895 00	394 62	564 62
Steers	94	3,351 65	94	4,951 06	....	1,599 41
Sheep	33	790 00	64	935 00	38 00	183 00
Swine	185	1,480 00	255	2,040 00	1,987 00	2,547 00
Total	391	11,667 65	514	16,597 06	6,804 79	11,734 20

SUMMARY.

RETURNS.

Gross returns from animals of all classes, including value of products, value of services and increase in value of young stock	$11,734 20
Manure, 950 tons at $1.00 per ton	950 00
	$12,684 20

EXPENDITURE.

Value of Food Consumed.

Meal, 354,644 lbs.	$3,546 44	
Hay, 432,000 lbs.	1,512 00	
Roots and ensilage, 1,624,000 ibs.	1,624 00	
Whole milk, 26,550 lbs.	265 50	
Skim milk, 170,000 lbs.	255 00	
Total	$7,202 94	
Value of straw for litter—95 tons at $4.00	380 00	
Cost of labour in connection with care of horses, cattle, sheep and swine:—		
Herdsman	600 00	
Two men at $480 each	960 00	
Three men at $432 each	1,296 00	
Total expenditure	$10,438 94	
		$10,438 94
Balance of returns over expenditure		$2,245 26

STAVE SILO.

In August, 1903, a round silo was erected 20 feet in diameter and 35¾ feet high, capacity about 250 tons.

The soil was excavated to a depth of 3 feet 8 inches, and the silo was built of cement to a height even with the surface of the surrounding earth. On top of this a stave silo 32 feet high was erected. The cost was as follows :—

COST OF SILO.

Labour—Woodwork	$ 55 70
" Foundation	47 31
Lumber	126 00
Hardware	6 87
Tarring	14 65
Painting	20 00
Iron bands	86 00
Cement	11 72
Total cost	$368 25

No roof was built in order to gain some information as the inconvenience or loss that would arise from snow and rain falling at will upon the surface during the winter.

The cement section was, of course, a matter of local convenience, and the cost of that part may be estimated as raising the cost of the silo about $75 above the cost of a stave silo of similar capacity with a common ring foundation.

ESTIMATING COST OF PRODUCTION.

The importance of determining cost of production of our grain and forage crops is scarcely questionable. The climatic and soil factors must, however, always be of primary importance, and on that account all estimates must be more or less particular in their bearing rather than general.

In the estimates which are included in the following reports on the different crops, rent, manure, labour, material (seed, twine, &c.) and wear and tear are considered. The item of supervision, of considerable moment on such farms as this, has been omitted, since most farmers in Canada do much of their own work, as well as direct the labour of such men as they employ.

The digestibility of a feed is another factor which must enter materially into any consideration of its economy of production, since, as is well known, the digestibility of our feeding stuffs ranges from about 25 per cent of the dry matter to practically 100 per cent. of the whole thing.

In dividing the cost of production of a grain crop between the straw and grain, however, where the digestible dry matter of the one part is so different in composition and value from that of the other, some additional standard is necessary. Since protein is that part of any ration the most expensive to supply, it was decided to make the digestible protein the basis of value. It is, of course, well understood that protein is not the only important constituent of straw, frequently it is of very minor consideration, indeed, as when used for litter.

CROP ON 200 ACRE FARM, 1903.

OATS

Five varieties of oats were grown. They were Banner, Improved Ligowo, Tartar King, Waverley and Goldfinder. They were sown on land that had been in roots or corn or meadow the preceding year. As the land was not of uniform character, the results will not indicate the comparative productivity of the different varieties.

The particulars of the plots sown are as follows:—

1. *Banner.*—39 acres, sown April 15, 2 bushels per acre; matured in 124 days, August 17. Yielded 2,233 bushels, or 57 bushels 9 lbs. per acre. Measured bushel weighed 41½ pounds.

	Lbs.
Total weight of straw and grain....	168,205
Weight of grain....	75,922

Grain constituted 45·1 per cent of the whole crop.

2. *Improved Ligowo.*—3 acres, sown April 21, 1¾ bushels per acre; matured in 116 days, August 15. Yielded 126 bushels 13 pounds or 42 bushels 4 pounds per acre. Measured bushel weighed 38 pounds.

	Lbs.
Total weight, straw and grain....	11,860
Weight of grain....	4,297

Grain constituted 36·2 per cent of the whole crop.

3. *Tartar King.*—3 acres, sown April 21, 2 bushels per acre ; matured in 118 days, August 17. Yielded 104 bushels, or 33 bushels 23 lbs. per acre. Measured bushel weighed 37½ pounds.

	Lbs.
Total weight, straw and grain....	14,935
Weight of grain....	3,570

Grain constituted 24 per cent of the whole crop.

4. *Waverley.*—2 acres, sown April 23, 1¾ bushels per acre; matured in 122 days, August 23. Yielded 84 bushels 12 lbs., or 42 bushels 6 lbs. per acre. Measured bushel weighed 38½ pounds.

	Lbs.
Total weight, straw and grain....	10,095
Grain weighed......	2,868

Grain constituted 28·4 per cent of the whole crop.

(Photo. by C. E. Saunders.)

Steers fattened at Central Experimental Farm and ready for British Market.

5. *Goldfinder.*—3 acres, sown April 23, 2 bushels per acre; matured in 125 days, August 25. Yielded 126 bushels 11 pounds, or 42 bushels 4 pounds per acre. Measured bushel weighed 36 pounds.

	Lbs.
Total weight straw and grain	13,980
Weight of grain	4,295

Grain constituted 30·8 per cent of the whole crop.

6. *Banner.*—2 acres. See mixed crop experiment.

COST OF GROWING 52 ACRES OF OATS.

Rent of land, 52 acres at $3 per acre	$156 00
Gang ploughing in autumn, 29 acres at $1 per acre	29 00
Cultivating and ribbing in autumn, 11 days at $2.50 per day	27 50
Cultivating and harrowing in spring, 9½ days at $2.50	23 75
One-fifth manure at the rate of 15 tons per acre, applied in root and corn year at $1 per ton	156 00
Seed, 104 bushels at 50 cents per bushel	52 00
Sowing five days at $2.50 per day	12 50
Use of machinery, 20 cents per acre	10 40
Shocking, 11 days at $1.33⅓	14 67
Loading and unloading, 24 days, $1.33⅓	32 00
Teams drawing, 8½ days at $2.50	21 25
Threshing, 2,782 bushels at 2½ cents per bushel	69 55
Total cost	$604 62
Cost to produce one bushel oats, value of straw neglected	21·7 cts.
Cost to produce one bushel oats, value of straw neglected and no allowance made for rent or manure	10·6 "

ANALYSIS OF COST.

Fifty-two acres produced 228,765 lbs. crop. The grain was weighed as it was threshed, but not so the straw. There was threshed 94,928 lbs. of grain, leaving 133,837 lbs. to be made up in chaff or straw. If 10 per cent be allowed for loss by drying out, etc., there would still remain about 120,000 lbs., or 60 tons of straw.

One ton oats contains about 184 lbs. digestible protein.

One ton oat straw contains about 24 lbs. digestible protein.

Hence we may arrive at the relative values of the two parts of the crop as follows :

94,828 lbs. oats contains 8,724 lbs. digestible protein.

60 tons straw contains 1,440 lbs. digestible protein.

The cost of production, $604.62, divided in this proportion, allows $518.96 for the grain and $85.66 for the straw. We might say, therefore, that the cost of production was 18·7 cents per bushel for the oats, and $1.43 per ton for the straw.

MIXED CROP EXPERIMENT.

Side by side on the second year of the rotation field, that is, on what had been pastured the preceding year, were sown seven plots of two acres each, the aim being to get some data as to the comparative yields of crops grown as mixtures and as pure

grain. The mixtures and pure grains are as follows, with the yield of the respective crops of both grain and straw in column 1 and the yield of grain in column 2 :—

	1. Grain and Straw. Lbs.	2. Grain. Lbs.
Plot 1.—Pure barley, Mensury, yielded..	9,230	3,686
Plot 3.—Pure oats, Banner, yielded..	9,690	4,320
Plot 3.—Pure pease, Prussian blue, yielded..	*	3,010
Plot 4.—Pease, 1 bushel; oats, 2 bushels..	7,930	2,867
Plot 5.—Oats, 1½ bushels; barley, 1 bushel..	8,670	3,578
Plot 6.—Wheat, ¾ bushel; oats, 1 bushel; pease, ¾ bushel; barley, ¾ bushel..	9,800	3,140
Plot 7.—Oats, 1 bushel; pease, 1 bushel; barley, 1 bushel..	8,380	2,090

*Not weighed.

INFLUENCE OF AMOUNT OF SEED AND SPACES BETWEEN ROWS OF GRAIN UPON QUALITY AND QUANTITY OF GRAIN HARVESTED.

A four acre field of land of as nearly uniform soil character as possible was divided into four 1 acre plots and sown as follows:—

Plot 1.—Waverley oats, in drills 7 inches apart.

Plot 2.—Waverley oats, in drills 14 inches apart.

Plot 3. Canadian Thorpe barley, in drills 14 inches apart.

Plot 4.—Canadian Thorpe barley, in drills 7 inches apart.

In quality no difference was perceptible in the case of the Waverley oats, and the measured bushel for each plot weighed 38½ lbs.

In the case of the Canadian Thorpe barley, however, the grain from the 7-inch apart drill plots was noticeably superior to that from the 14-inch drills plot.

Plot 1.—Waverley oats, sown April 23, drill set at 1¾ bushels per acre; matured in 122 days. Yielded 45 bushels 15 lbs. per acre. Measured bushel, 38½ lbs.

This plot was sown the ordinary way with seed drill, drills 7 inches apart and sowing 14 gallons seed per acre.

	Lbs.
Total weight straw and grain..	5,073
Weight of grain..	1,545

Grain constituted 30·4 per cent of the whole crop.

Plot 2.—Waverley oats, sown April 23, drill set at 1¾ bushels per acre; matured in 122 days, August 23. Yielded 45 bushels 5 pounds per acre. Measured bushel weighed 38½ lbs.

This plot was sown with the same drill as Plot 1, but had every alternate spout blocked, making the drills 14 inches apart and sowing 7 gallons per acre.

	Lbs.
Total weight straw and grain..	5,300
Weight of grain..	1,535

Grain constituted 28·9 per cent of the whole crop.

Plot 4.—Canadian Thorpe Barley (two-rowed), 1 acre sown April 22, 2 bushels per acre; matured in 110 days, yielded 32 bushels 9 lbs. per acre. Measured bushel weighed 52½ lbs.

This plot was sown in the usual way with a force feed seed drill, rows 7 inches apart, sowing 2 bushels per acre.

	Lbs.
Total weight of grain and straw..	4,190
Weight of grain..	1,545

Grain constitued 36·8 per cent of the whole crop.

Plot 3.—Canadian Thorpe Barley, sown April 22, seeder set to sow 2 bushels per acre; matured in 110 days. Yielded 28 bushels 31 lbs. per acre. Measured bushel weighed 51¾ lbs.

This plot was sown with same drill as above, but every alternate spout blocked, making drills 14 inches apart, sowing 1 bushel per acre.

	Lbs.
Total weight of grain and straw....................	4,530
Weight of grain.............................	1,375

Grain constituted 30·5 per cent of the whole crop.

SOILING CROPS.

Mixed crop, 11 acres oats, pease, barley, equal parts by weight, 2½ bushels per acre, and clover 10 lbs. per acre.

This mixture was sown at intervals from April 14 to June 7, cut for green feed for cattle and hogs, in some parts two crops were cut and an excellent growth of clover was afterwards pastured.

HAY.

Hay was harvested off 66 acres. Owing to the long spring drought the yield was only small. There was no second crop off the first year meadows for the same reason.

The total crop off 66 acres was 154 tons 1,480 lbs., making an average yield of 2 tons 689 lbs. per acre.

COST OF GROWING 66 ACRES OF HAY.

Rent of land at $3 per acre........................	$198 00
One-fifth manure at the rate of 15 tons per acre, $1 per ton.	198 00
Half cost of seed................................	50 16
Seven days' cutting with mower at $2.50 per day..........	17 50
Seven and one-half days' raking at $1.75 per day........	13 12½
Six days' teddering at $1.75 per day..................	10 50
Rent of farm machinery, oil, &c., at 20 cents per acre......	13 20
Cocking, loading and unloading, 48½ days at $1.33⅓ per day.	64 75
Thirteen days' drawing to barn at $2.50 per day..........	32 50
Four days' team on horse fork at $2.50 per day..........	10 00
	$607 93½

Total hay, 154 tons 1,480 lbs.
Cost to produce 1 ton in barn, $3.93.

EXPERIMENTS WITH GRASSES AND CLOVERS.

To gain some information as to the value of the more common grasses and clovers, as hay and pasture crops when sown together in different proportions, the following experiment was conducted:—

In 1902 that 40 acre field of the 200 acre farm which had been under corn in 1901, was sown to Banner oats. Beginning at one side of the field, it was laid off in 5 acre plots, each plot extending clear across the field, and including in its area sandy, loamy and peaty soils. The plots were similar in the variety of the soils they included, and under the usual hay and pasture mixture of 10 lbs. timothy and 8 lbs. clover would have been expected to give similar returns, with possibly a slight advantage in favour of plots 1 and 2.

Particulars of seeding and returns in hay are as follows:—

—	Grasses.	Lbs.	Clovers.	Lbs.	Yield per acre.		Total Yield.	
					Tons.	Lbs.	Tons.	Lbs.
Plot 1, 5 acres	Timothy	10	Common Red	8	1	1,502	8	1,510
Plot 2, 5 acres	Timothy Bromus Inermis Orchard Grass	4 8 8	Alfalfa Common Red	8 6	1	1,184	7	1,920
Plot 3, 5 acres	Timothy Bromus Inermis Orchard	4 8 8	Alsike Common Red	2 6	1	836	7	180
Plot 4, 5 acres	Timothy Orchard	5 16	Alsike Common Red	2 6	0	1,504	3	1,520
Plot 5, 5 acres	Timothy Bromus Inermis	5 15	Alsike Common Red	2 6	1	934	7	670

The early part of the growing season was particularly unsuitable for grasses and clovers on account of the dry weather. The following notes are submitted, however, and may serve to modify to some extent the teachings of the above report.

Plot 1.—Both Clover and Timothy made a strong rapid growth on each of the various kinds of soil.

Plot 2.—Timothy and Brome grass made good growth on all soils. Alfalfa did exceedingly well on sand and loam, but was utterly lacking on the peat. Red clover grew all over. Orchard grass very weak growth.

Plot 3.—Timothy, Brome and Orchard, as in plot 2. Alsike lacking and Red clover a fair growth all over.

Plot 4.—Timothy good growth for seed sown. Orchard a poor tufty growth due no doubt in large measure to adverse weather conditions. Alsike clover lacking. Red clover fair growth all over.

Plot 5.—Timothy and Brome good crop all over. Alsike lacking. Red clover fair growth all over.

VALUE AS PASTURE MIXTURES.

It was of course quite impossible to estimate the exact amount of pasturage available from the aftermath of each plot, but the following notes may be of some value.

Plot 1.—Fairly thick growth, apparently palatable to cattle.

Plot 2.—Excellent growth, not favoured by cattle at first, but when taste for alfalfa was once acquired, this plot became the favourite grazing plot, and appeared to furnish much more food than any one other of the plots.

Plot 3.—Poor aftermath. Cattle not very fond of same, and grazed thereon only after plots 2, 1 and 5 were eaten close.

Plot 4.—Poor aftermath. Not liked by cattle.

Plot 5.—Fair aftermath. Cattle seemed to like it best next after plots 2 and 1.

LOSS OF WEIGHT.

IN HAY.

To gain some information as to the amount of loss of weight in hay in mows, the following experiment has been conducted :—

On August 15, 1903, two small mows were filled with well cured hay from the same field from 1 till 5 o'clock in the afternoon.

Mow No. 1—Held 4 tons 800 lbs. new hay. This hay when weighed December 7, 1903, was found to contain 4 tons 800 lbs., a loss of 375 lbs. or 4·3 per cent in 113 days.

Mow No. 2—Held 4 tons 80 lbs. new hay. This hay when weighed January 7, 1904, was found to contain 3 tons 1,665 lbs., a loss of 415 lbs., or 5·1 per cent in 144 days.

CORN.

Five varieties of corn were sown:—

Early Mastodon.—Planted in hills, 5 acres, sown May 16, cut for ensilage September 23. Yielded 13 tons 265 lbs. per acre. Growth strong; rather uneven, on account of the very weather just after sowing. Very well cobbed, cut in dough stage. Promising sort.

Selected Leaming.—Planted in hills, 35 inches apart, 7 acres. Sown May 23, cut ensilage September 26 to 28; yielded 15 tons 1,735 lbs. per acre. Growth strong and even, well cobbed, but very late owing to bad season. Cobs mostly in early milk. Part of this plot suffered from drought in spring, lessening weight per acre.

Longfellow.—Sown in drills, 35 inches apart, 4½ acres. Sown May 23, cut for ensilage September 26; yielded 13 tons 52 pounds per acre. Growth strong and even, well cobbed, mostly in milk, some in dough stage.

Selected Leaming.—Sown in drills, 35 inches apart, 7 acres. Sown May 23, cut for ensilage September 30; yielded 13 tons 1,947 lbs, per acre. This plot also suffered from drought, lessening weight per acre.

Selected Leaming.—Planted in hills, 35 inches apart, 7 acres. Sown May 23, cut for ensilage September 25; yielded 8 tons 879 lbs. per acre. This plot suffered very heavily from drought, so the yield per acre was lessened.

Thoroughbred White Flint.—3 acres. Sown June 3, cut for ensilage September 28; yielded 16 tons 156 lbs. per acre. Growth very strong and even; good showing for cobs mostly in early stage sown too late for making best ensilage. This variety and the next 3 acre plot of Mammoth Cuban were sown to replace root crop ruined by drought.

Mammoth Cuban.—3 acres sown June 3, cut for ensilage September 29; yielded 16 tons 1,830 lbs. per acre. Growth very strong, even, good showing for cobs, mostly in very early stage.

Cost of Growing 34 Acres of Corn—

Rent of land at $3 per acre	$102 00
Cultivating, ribbing and shallow ploughing, 6 days at $2.50 per day	15 00
One-fifth manure, at 15 tons per acre, $1 per ton	102 00
Ploughing in autumn, 8 acres at $2 per acre	16 00
Cultivating in spring, 3 days at $2.50	7 50
Ploughing 14 acres at $2, gang ploughing 8 acres at $1 in spring	36 00
Harrowing in spring, 2 days, $2.50	5 00
Seed, 25 lbs. per acre, 850 pounds at $1 per bushel	15 19
Sowing, team, 3 days at $2.50 per day	7 50
Marking, 2 days, 1 horse at $1.75 per day	3 50
Planting 7 acres, 2 days at $1.33⅓ per day	2 67
Harrowing after sowing, 4 days at $2.50	10 00
Hoeing, 55 days, $133⅓	73 33
Cultivating team, 33 days at $2.50	82 50
Cultivating single horse, 14 days, $1.75	24 50

Cutting with corn harvester, 7 days at $2.50	$17 50
Loading, unloading, tramping and putting into silo, 69 days, $1.33⅓ per day	92 00
Drawing with team, 24 days at $2.50	60 00
Use of machinery, 20 cents per acre	7 05
Twine 5 lbs. per acre, 170 lbs. at 12 cents	20 40
Use of engine, fuel, ensilage cutter, and engineering, 6 days at $6.50 per day	39 00
Total cost	$738 64

Average yield per acre, 13¼ tons.
Thirty-four acres yielded 450 tons 1,107 lbs.
To produce 1 ton ensilage in silo cost $1.64.
Cost to produce 1 acre corn in silo, $21.73.

ROOTS.

Owing to adverse weather conditions in May and June, it was found necessary to break up on June 2 all the land that had been sown to roots about the middle of May.

It was decided to reseed one acre to sugar beets, mangels and turnips. Below are reports upon the different small plots. All were sown on June 15 and harvested October 30.

SUGAR BEETS.

Wanzleben—⅛ acre. Yielded 2,870 ibs. or 47 bushels 50 lbs.; yield at the rate of 11 tons 960 lbs. per acre.

Giant Sugar Feeding Mangel—⅛ acre. Yielded 2,910 lbs. or 48 bushels 30 lbs.; yield at the rate of 11 tons 1,280 lbs. per acre.

MANGELS.

Gate Post Red—¼ acre. Yielded 8,220 lbs. or 133 bushels 40 lbs.; yield at the rate of 16 tons 80 lbs. per acre.

TURNIPS.

Prize Purple Top—½ acre. Yielded 10,280 lbs. or 171 bushels 20 lbs.; yield at the rate of 10 tons 560 lbs. per acre.

EXPERIMENTAL SILO.

Three years ago a silo was constructed to be used for experimental purposes.

Different green crops have been tested as to their fitness for ensilage production, and reported upon in former reports.

This silo was again filled during September, 1903, but as the contents have not been fed out yet, it is impossible for me to report upon the same.

The contents at present are as follows, beginning at the bottom:—

		Lbs.
1.	Pure corn late milk stage	9,370
2.	Corn late milk stage	5,280
	Rape cut when about 15 inches high, mixed while going through blower or cut box	5,280
3.	Pure corn, late milk stage	960
4.	Pure rape, cut when about 15 inches high	5,620
5.	Corn, late milk stage	12,370
	Sunflower heads mixed going through machine	2,120
6.	Horse beans	1,002

LITTER OR BEDDING FOR CATTLE.

An experiment to gain some information as to the influences affecting the consumption of straw for litter was conducted during the month of March.

Experiment lasted 23 days.

Lot 1.—9 three year old steers in box stall required during 23 days 2,375 lbs. long wheat straw.

Lot 2.—9 three year old steers tied required during 23 days 1,150 lbs, long wheat straw.

Lot 3.—9 three year old steers tied required during 23 days 2,300 lbs. cut wheat straw.

EFFECTS OF ROTTING OR HEATING OF MANURE UPON VITALITY OF WEED SEEDS.

In March some straw containing a considerable amount of scutch, twitch or quack grass (Agropyrum repens) was used for bedding the steers in the box stalls, and it was decided to heat or rot half the manure to note the effect upon the vitality of the objectionable seeds likely to be found among the straw.

The manure produced weighed 42,876 lbs. Half of this was hauled out upon the field and put in small piles and the other half was piled in a low flat topped pile to induce rotting or heating.

The manure weighed when piled 21,438 lbs., and when drawn to the field weighed 18,650 lbs.

The rotted manure was put on a plot of land adjoining the plot upon which the green manure had been placed.

A careful watch was kept to note the comparative weediness of the two plots.

Both plots showed a considerable growth of scutch grass, but the rotted manure plot seemed quite as badly infested as the green manure plot.

REPORT OF THE HORTICULTURIST

(W. T. MACOUN.)

December 1, 1903.

DR. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the seventeenth annual report of this division. In the following pages will be found the results of some of the most important experiments conducted during the past year.

Character of season.—Winter set in at Ottawa on November 25, 1902, with the ground frozen, and on the 26th and 27th, five inches of snow fell, which gradually increased during the month of December, the result being that practically all the frost came out of the ground and, as in the winter of 1901-02, the soil remained unfrozen all winter. December was an unusually cold month, the temperature falling to 25° F. below zero on the 9th. January was also cold, the temperature going down to 29·8° F. below zero on the 19th, this being the coldest day of the winter and the lowest temperature since 1896, when the lowest was 30·7° F. below zero. There were a few very cold days in February, the coldest being 22° F. below zero on the 18th, but the month on the whole, was only moderately cold. There was an abundant snowfall in January and February, with few days above freezing, so that although the weather was cold there was good protection for the roots of trees and for herbaceous plants. The weather became mild during the first week of March and continued so all month with very little snow or rain. Sleighing was gone before the middle of the month. The first ploughing was done in the plum orchard on March 23, the earliest date in the history of the farm. The ground was in excellent condition with no frost in it. April was mild to cool, except during the last three days, when it was warmer, the temperature rising on the 30th to 82° F. On May 1 and 2, 1903, there were seven and nine degrees of frost respectively, which did much damage. Market gardeners who had set out early vegetables, lost heavily. Asparagus, wherever it showed, was frozen back to the ground, and rhubarb was considerably injured also. Apples were unaffected. The flowers of the native plums were injured by this frost, and the crop much lessened. Nearly all the flowers of the cherries were destroyed, although a large part had probably been already killed by winter. Strawberries were badly affected by frosts on May 24 and 29, and also by the drought, as a result of which the crop of many varieties was practically a failure. Grapes, raspberries, currants and gooseberries were little affected.

The severest drought since the Central Experimental Farm was established, seventeen years ago, and one of the severest in the history of this country, was experienced this year. There was little precipitation of any kind during the months of March, April and May, and it was not until June 11, that the drought was broken. Notwithstanding the moisture from the snow which fell in the winter, the ground appeared drier during the month of May than it had ever been in midsummer before. Vegetable seeds, which had been sown on May 8, did not germinate until June 22. Potato sets, where they were near the surface, in some cases dried up in the ground. Apple trees did not suffer, as the soil was kept cultivated. Trees in the plum orchard, however, were affected, as the soil is naturally drier there, and it was necessary to water and mulch the young trees to keep them from dying. The dry weather was very hard on

herbaceous plants and trees, which had been set out in the spring, and although the perennials in the botanic garden were watered three times, a considerable number died from the drought. By June the grass was dried up as in the driest time in midsummer. There was abundant rain after June 11, and it was not long before there was little indication left of the drought.

June, July and August were cool for summer months. The warmest day was on July 8, when the temperature rose to 90° F. In August the highest temperature was only 80° F., which occurred on the 6th. There were a great many rainy days in these months. September and October were fine and warm, and fruits and vegetables matured well. Although there was a little white frost locally during the last week of September, there was no frost recorded by the thermometer until October 19, when it was 30° F., and until that date even tomatoes and melon vines were uninjured. On October 26, the temperature dropped to 27° F., when most foliage was destroyed.

November was mild until the 5th, when it became cooler. Winter set in on November 16, and there was sufficient snow for sleighing by November 24. The last week of November was cold, the temperature falling to zero on the 26th.

Fruit and vegetable crops.—The apple crop in the provinces of Ontario and Quebec was good this year, and the fruit was of much better quality than last year, the dry weather in the early part of the season being unfavourable to the development of the apple spot fungus, as a result of which the fruit was much freer from spot than usual, this being especially true of the fruit in eastern Ontario and Quebec. There was a heavy crop of peaches, which made the fruit very cheap this year. There was also a good crop of pears. The plum crop was unusually heavy, and on the whole did not prove profitable. Thousands of baskets were left to rot in the orchards, as the markets were glutted with this fruit. There was an average crop of grapes in the Niagara district, but in the Lake Erie district the crop was nearly ruined by black rot. The crop of small fruits was an average one, except in northern and eastern Ontario and in some parts of the province of Quebec, where spring frosts and drought reduced the crop. Strawberries suffered most.

At the Central Experimental Farm the apple crop, though considerably less than last year, was fine in quality. There were few worms of the codling moth and no spot, and the fruit matured well. The plum crop, though better than last year, was not an average one. Cherries were a failure again this year, owing to winter killing of the flower buds. The fine weather of September and October was very favourable to grapes, and 101 varieties ripened. The crop of raspberries and currants was about an average one, but the dry weather reduced the gooseberry crop somewhat. The blackberry crop was better than usual this year. The yield of strawberries was light, as frosts when the plants were in bloom and the drought were very hard on this fruit. Owing to the dry weather in spring which delayed the germination of the seeds, to the spring frosts, and to the cool summer, it was a poor year for vegetables in eastern Ontario and part of the province of Quebec. The potato crop was much reduced by the dry weather, and by blight and rot in the autumn where the vines were unsprayed. Tomatoes did not ripen well and the crop was not nearly as large as usual. The melon crop was a failure. Celery was good, owing to the cool moist weather of late summer.

MEETINGS ATTENDED, ADDRESSES GIVEN AND PLACES VISITED.

A part of the work of the Horticulturist is to attend meetings of farmers, fruit growers and horticultural societies throughout the country, and to give addresses on horticultural topics. During the past year quite a number of such meetings were attended.

Following were the meetings attended with subjects of addresses:—

Annual meeting, Ontario Fruit Growers' Association, Walkerton, Ont., December 1, 2 and 3.—'Special Methods of Fruit Culture for Special Conditions.'

Annual meeting, Quebec Pomological Society, Waterloo, Que., December.—'Strawberries.'

Annual meeting, New Brunswick Farmers' Association, Sussex, N.B., January 26-28.—'Preparation of Soil, Cultivation and Fertilizing of Orchards and Potato Culture.'

Woodstock, N.B., January 29-30.—'Strawberries.'

Annual meeting, Nova Scotia Farmers' Association, Windsor, N.S., February 4.—'Potato Culture.'

Annual meeting, Prince-Edward Island Fruit Growers' Association, Charlotte-'The Individuality of Fruits.'

Annual meeting, Prince Edward Island Fruit Growers' Association, Charlottetown, P.E.I., February 10.—'Site and Protection of an Orchard.'

Meeting at Miscouche, P.E.I., February 12.—'Fruit Growing.'

Meeting at Hazelbrook, February 11.—'Fruit Growing.'

Meeting at Smith's Falls, Horticultural Society, Smith's Falls, Ont., March 31.—'The Improvement of the Home Grounds.'

Meeting, Belleville, Fruit Growers' Association, Belleville, Ont., April 8.—'Recent Changes in Orchard Methods.'

Orchard meeting, at Vernon, Fallowfield and Metcalfe, Ont., July 7, 8 and 9.—'Demonstrations in Orchard Work.'

Summer meeting, Quebec Pomological Society, Abbotsford, Que., August 26, 27.—'Individuality of Fruits,' 'Hardy Climbers.'

Biennial meeting American Pomological Society, Boston, Mass., September 10-12.—'The Best Amateur Red Raspberry,' 'Progress in Horticulture in Ontario during the past Twenty-five years.'

Annual meeting, Ontario Fruit Growers' Association, Leamington, Ont., November 24-26.—'Hardy Fruits for Northern Districts.'

In addition to attending the above meetings, I visited the Toronto exhibition on September 7, and the Arnold Arboretum, and the Massachusetts Agricultural Experimental Station while at Boston, obtaining much information which will prove valuable to me in my work. I also visited the orchard of the Trappist fathers, La Trappe, Que., those of R. W. Shepherd, Como, Que., R. Brodie, Westmount, Que., and also Mr. W. W. Dunlop, Outremont, Que., and also drove sixty-five miles along the south shore of the St. Lawrence between St. Denis and Montmagny, having the opportunity at that time of visiting the orchards of J. C. Chapais, St. Denis, and Auguste Dupuis, Village des Aulnaies. At all these places there were new and interesting things to be seen and I got many suggestions for future work.

ACKNOWLEDGMENTS.

As in past years, I have been greatly aided in my work by the fruit growers of Canada, who have been always ready to assist me. During the past year, when preparing a bulletin on plum culture, it was necessary to write to a large number of persons for information regarding varieties and methods of culture, and I always received courteous assistance. I take this opportunity of thanking those fellow workers for their ready and willing aid.

At the experimental farm, Mr. J. F. Watson and Mr. H. Holz have again proved themselves able assistants in the work, the former by the manner in which he has handled the correspondence and much of the office work, and the latter in his capacity as foreman, by his untiring and faithful supervision of the work outside.

Donations.—The horticultural division is favoured every year with donations of plants, scions, seeds, &c., from institutions, and persons who either desire to have them tested at the experimental farm or who send them merely as gifts to the institution. The horticulturist is always pleased to receive such donations and to give them a fair

trial. In the case of seedling fruits, however, it is desirable to see the fruit and pass judgment upon it before accepting trees or scions, as by adopting this plan only the really promising kinds are tested.

The following donations were received during the year, and we beg to gratefully acknowledge the same:—

DONATIONS.

Sender.	Donation.
Arnold Arboretum, Jamaica Plain, Mass	Seeds, collection of.
Bug Death Chemical Co., St. Stephen, N.B	Bug Death, 1 case of.
Baker, E. P., Kentville, N.S	Scions, Beauty of Horton apple.
Brodie, R., Montreal, Que	" Grand Duke Contantine apple. Burbank, Lachine and Brodie plums.
Ballantyne, James, Ottawa East, Ont	Scions, No. 2 seedling apple.
Beall, Thomas, Lindsay, Ont	" seedling apple.
Carter, J. H., Massawippi, Que	" Shiawassee Beauty apple.
Cass, C. A., L'Orignal, Ont	" of seedling apples.
Carstesen, Hans Peter, Billings Bridge, Ont	" Carstesen plum.
Cockburn, J. P., Gravenhurst, Ont	" Algonquin apple.
Dunlop, W. W., Outremont, Que	" and trees of Montreal seedling plums.
Dempsey, W. H., Trenton, Ont	" Hubbardston Nonsuch apple.
Fisk, J. M., Abbotsford, Que	" apple, Canada Baldwin, Stettin Red.
Greenfield, Samuel, Ottawa East, Ont	" seedling, apple and plums.
Gardener, James, Cornwall, Ont	" of unknown apple.
Graham, J. I., Vandeleur, Ont	" hardy peach.
Hamilton, Robert, Grenville, Que	Seeds of Japanese trees and vegetables.
Harkness, A. D., Irena, Ont	Scions, Red Fameuse apple.
Iowa Experimental Station, Ames, Ia	" Tatge and Ames plums, and Brilliant and Avista apples.
James, George, Lochlin, Ont	Tubers, James' Nugget potato.
Johnston, Asa., East Farnham, Que	Scions, apple.
Jack, N, E., Chateauguay Basin, Que	" May Queen plum.
Livingston, L. L., Frankville, Ont	Buds, seedling apple.
Little, E. E., Ames, Ia., U.S	Scions, apple and plums.
Lizotte, Rev. J., St. Jean des Chaillons, Que	" seedling apple.
Lagace, Jules, Fraserville, Que	" "
Messenger, R. J., Bridgetown, N.S	" "
Macoun, J. M., Ottawa, Ont	Seeds of Western plants.
Morgan, H. H., Manchester, N.H	Tubers, Morgan White and Morgan Seedling potatoes
Morrow, J. F., Calumet, Que	Scions, Seedling apple and Knudson cherry.
Newman, C. P., Lachine Locks, Que	" peach.
Reynaud, G., La Trappe, Que	" Perdrigon plum, Flemish Beauty pear.
Rowley, Joseph, Cummings Bridge, Ont	Trees, Rowley and No. 2 seedling plums.
Royal Botanic Gardens, Kew, England	Seeds, collection.
Shaw, R. M., Waterville, N.S	Plants, Big Bobs strawberry.
Scott, W. A., Montreal, Que	Buds, Blue Pearmain apple.
Saunders, W. E., London, Ont	3 trees Betula lenta
Shepherd, R. W., Como, Que	Scions, Windsor Chief apple.
Stephens, C. L., Orillia, Ont	Seedling gooseberry; Scions, hardy peach.
Tuttle, A., Clark, Baraboo, Wis., U.S	Scions, apple.
Whyte, R. B., Ottawa, Ont	Walnuts, 1 bushel.
Waugh, Prof. F. A., Amherst, Mass., U.S	Scions, Palmer Greening and Scarlet Cranberry apples.

APPLES.

The apple trees wintered well this year and there were fewer deaths than usual in the orchard. Vacancies were filled by new varieties and by additional trees of some kinds found desirable to grow in this district. The crop was below an average one, but the fruit was of good quality, there being no scab and little codling moth. There were 199 named varieties fruited this year, and of these there was a much larger proportion of winter apples than in previous years.

SEEDLING AND CROSS-BRED APPLES.

This year 208 trees were added to the seedlings already planted, making a total of 1,596 now in the orchards. The first fruit among the seedlings planted in 1890 was borne this, year when one Wealthy seedling bore three apples. In the Russian seedling orchard 31 trees bore which had never fruited before, making a total of 225 which have fruited altogether. Of these, twenty-seven have been thought worthy of propagation for trial in northern Ontario, and Manitoba and the North-west Territories, but practically none of them are sufficiently promising for districts where varieties already recommended succeed.

Some further work was done in cross-breeding apples, the varieties used for this purpose being McIntosh Red, Lawyer, Northern Spy, North-western Greening, and Milwaukee.

TOP GRAFTING.

The work of top grafting the tenderer varieties on hardy stocks is continued and extended each year, as it is believed that this is a valuable line of work. Already 90 varieties have been top grafted. A tree of Northern Spy top grafted in 1893 bore over one barrel of apples this year. This variety has not proven satisfactory when grown as a standard tree.

SHIPMENT OF APPLES TO GLASGOW IN COLD STORAGE.

As the trees in the apple orchard at the Central Experimental Farm get larger the crop naturally increases, and as there are in some cases a number of trees of each kind, a fair quantity of some varieties can now be obtained. Although most of the apples are sold on the Ottawa Fruit Exchange, it was thought that it might be profitable, and at the same time of interest to fruit growers, to send some to Great Britain. A small shipment of 100 bushel boxes of autumn apples, therefore, was made to Glasgow last year, with good profit. The results of this shipment, which were published in the Annual Report of 1902, interested a great many, and various letters of inquiry were received. These came especially from small growers, who were pleased to get in the report all the details regarding the shipping of the fruit, cost of boxes and other material, and the details regarding the rates charged on the steamer and on the other side of the Atlantic, as fruit growers who have but a small quantity to sell are reluctant to adopt a new plan without knowing all the particulars.

This year another small shipment, mostly of Duchess of Oldenburg, was made in cold storage, and although the profits were not quite as large as last year they were still above what could have been obtained here.

The fruit was sent by the steamer *Kastalia,* which sailed from Montreal on August 20, and arrived at Glasgow on August 31.

The apples were picked on August 13, 14, and 15, and brought under cover and packed in boxes, the inside measurement of which was: depth, 10½ inches, width, 11½ inches, length, 22 inches. The sides and top and bottom were made of three-eighth inch boards, and the ends of half-inch, dovetailed and glued. Only apples free from defects were selected. These were wrapped in tissue paper, and packed tightly in layers, a sheet of cardboard being put between each layer and a thin layer of Excelsior between the apples and the boards at top and bottom. There were four layers of fruit to a box. No Excelsior was used as packing among the apples, as different sized apples were used for this purpose. The apples when picked were practically full grown, well coloured, but still quite hard. The fruit was kept in a cool place until August 18, when it was taken to the station at Ottawa, and put on a freight car, which left for Montreal that night. The fruit arrived in Montreal early on the morning of August 19, but just reached the steamer before the cold storage compartments were closed in the evening. More time will be allowed another year, as the fruit might not have got

into cold storage. The rate for cold storage and freight on the steamer was 30 shillings for 40 cubic feet.

Following is the account sales:—

43 and 44 Bazaar and Covent Garden Market, 25 Stirling St., City.
Glasgow, Septemebr 4, 1903.

Account sales of 90 boxes apples ex. *Kastalia.* Sold by Thomas Russell, by order and for account of Mr. W. T. Macoun, Central Experimental Farm, Ottawa:—

W. T. Macoun.

	£	s.	d.	£	s.	d.
XXX......10 boxes North Star, 7 | —............	3	10	0			
80 " Duchess, 5 | 6...............	22	0	0			
				25	10	0
Charges.						
Freight on goods....................................	7	5	2			
Freight on empties, river and harbour dues, master porterage, landing, selecting, coopering, catalogues, advertising, &c., cartage to warehouse, housing and delivery..	2	5	0			
Commissioner and guarantee..............................	1	5	6			
				10	15	8
Net proceeds..				14	14	4=$71.29

The expenses of the shipment on this side of the Atlantic, exclusive of growing the fruit, picking, packing and sending to the car at Ottawa, which would be necessary in any shipment, were:—

Cost of 90 boxes at Toronto, 14 cents..................	$12 60
Freight on 90 boxes, Toronto to Ottawa..................	2 05
Cost of 63 lbs. Excelsior at 3 cents....................	1 89
Cost of 450 strips of cardboard.........................	2 70
Cost of 4 reams of tissue paper at $1.25................	5 00
Wrapping, 66 hours at 7½ cents an hour..................	4 95
	$29 19

Leaving a net balance of $42.10, or approximately, 46·77 cents per box. There were about 180 apples in each box of Duchess, or about one-third of a barrel, thus making a net balance of, approximately, $1.40 per barrel. This is not a large profit, but it is a fair one, and better than would have been obtained at Ottawa by selling the fruit in baskets, barrels or boxes. In shipping large quantities of fruit the cost of material would be much less and the profits greater.

Following is the report of the government agent who saw this fruit sold at Glasgow:—

8 Glenbank Terrace,
Lenzie, N.B., September 7, 1903.

'These arrived at Glasgow on August 31 in very good condition, and were kept at a temperature of 35 to 40 degrees in refrigerator chamber during the voyage over. The 80 cases Duchess made 5s. 6d. a case. These showed up well for the variety, but several buyers complained to me about the lightness of the cases, which only weighed 36 pounds gross. This meant about 30 pounds of fruit in each case. The 10 cases North Star realized 7s. They were in excellent condition and looked well. I like the way you had these 10 cases packed, and think the sheet of cardboard between each layer with a little Excelsior top and bottom could not be improved upon.'

(Signed) John Brown,
Inspector at Glasgow.

Both this year and last, the complaint was made that the weight of fruit per box was too small. The Duchess is, however, a light apple and very little additional weight of fruit could have been obtained by another method of packing this variety.

NEW OR LITTLE KNOWN VARIETIES OF APPLES.

A large number of varieties of apples have been already described in the reports of the 'Horticulturist.' The following five kinds have not been described in the reports before. All of these descriptions are original, having been made from specimens in the writer's possession, and all from fruit grown on the Central Experimental Farm:—

Dempsey No. 80.—Originated at Trenton, Ont., by the late P. C. Dempsey. A cross between Northern Spy and Golden Russet. Fruit roundish, regular; size above medium; cavity deep, narrow, slightly russeted; stem short, slender to moderately stout; basin medium depth and width, smooth; calyx partly open; colour pale yellowish green splashed and washed with deep reddish pink; dots few, large, indistinct; skin, thick, tough; flesh yellow, firm, juicy; core small; briskly subacid, not highly flavoured; quality above medium; season late winter; tree vigorous and bears young. A promising winter apple at Ottawa.

Dudley (North Star).—Originated in Maine. Fruit roundish; size large; cavity open, deep, slightly russeted; stem medium length, slender; basin deep, medium width, slightly wrinkled; calyx partly open; colour pale yellow; streaked and splashed with deep lively red; dots few, small, pale yellow, indistinct; skin moderately thick, tender; flesh yellow, rather coarse, tender, moderately juicy; core small; subacid, pleasant flavour, quality above medium, almost good; season late September to early winter. Tree vigorous and productive. This is about the same season as Wealthy, but does not keep as long. A handsome apple.

North-western Greening:—Originated in Wisconsin. Fruit large, roundish to roundish oblong, slightly conical, regular; cavity deep, medium width, sometimes more or less russeted; stem short, stout; basin medium depth and width; almost smooth; calyx open; colour green at first then greenish yellow when fully mature; dots indistinct; skin thick, tough; flesh yellowish, firm, moderately juicy; core medium, closed; mildly sub-acid, pleasant flavour; quality good. Season mid-winter to late winter. Tree hardy at Ottawa and a vigorous grower, but inclined to be top heavy, causing splitting of the trunk. Not an early bearer, but is eventually quite productive. The fruit is very symmetrical and has an attractive smooth skin. One of the most promising winter apples for the north.

Rideau (Wealthy female X Duchess male).—A cross-bred apple, originated at the Central Experimental Farm, by Dr. C. E. Saunders in 1894, and fruiting this year for the first time. Fruit roundish, angular; size medium to large; cavity deep, open; stem short, stout; basin deep, open; calyx open or partly open; colour pale yellow, well washed and splashed with bright crimson, especially on sunny side; dots numerous, small, indistinct; bloom none; skin moderately thick, tender; flesh yellowish, remarkably firm, coarse, juicy; core rather small; subacid, sprightly; aromatic, though not high flavoured; quality good; season late September. Resembles Duchess somewhat in outward appearance, but is longer. There is a suggestion of Wealthy in flavour and sprightliness. Shows indications of water-core. A handsome apple and may prove useful, as its season is between Duchess and Wealthy.

Windsor Chief.—Originated in Wisconsin. Fruit oblate to roundish, slightly angular; size medium to large; cavity shallow, open, more or less russeted; stem medium length, stout; basin medium depth and width, almost smooth; calyx open; colour yellow, well washed with dark red; dots few to medium, yellow, prominent; skin thick, tough; flesh yellowish, firm juicy; core small; mildly subacid, pleasant flavour; quality good, season late winter. Tree hardy, vigorous, productive. Fruit hangs well. A promising apple. A little too dark in colour.

SEEDLING FRUITS.

Quite a number of seedling fruits were again sent in for examination this year, most of which were apples, although pears, plums and peaches were also represented. In most cases full descriptions were made of the fruit, which will be useful for future reference. If the variety was considered promising, scions were asked for and those received will be grafted. As a result of this grafting of seedling varieties, every year there is now a large number of these growing at the experimental farm. As these fruit they are recommended for general planting or otherwise as their merits deserve.

We trust that fruit growers will continue to send in specimens of promising seedling fruits for examination.

Full descriptions follow of the best of those received.

Record.	Province.	Address of Sender.	Description of Fruit.
			APPLES.
250	N. B......	Morley Small, Lawson	See full description.
251	Que	A. C. Kennesen, Dixville...........	Medium size, pale yellow, quality above medium, season autumn, not specially promising.
252	"	Theodore Hanon, Mt. St. Hilaire....	See full description.
253	"	" "	Medium size, splashed with purplish red, fall, not promising.
254	"	" "	Medium size, deep purplish red, early fall, not promising.
255	"	R. Hamilton, Grenville..............	No. 1, above medium size, dark purplish red, medium quality, season October.
256	"	" "	No. 2, above medium to large, yellow with purplish red on sunny side, quality above medium, season late September.
257	"	" "	No. 3, medium size, yellow and reddish pink, good quality, season October, not attractive enough.
258	"	" "	Medium size, bright purplish red, medium quality, season late fall.
259	"	" "	Medium size, pale yellowish green with deep red on sunny side, quality good, season late autumn. Evidently Fameuse seedling. Not as good as Fameuse.
260	"	" "	See full description.
261	"	" "	Large, orange red, quality almost good, season October, not nearly as good as Wealthy.
262	"	" "	Large, deep purplish red, quality above medium to good, season autumn, not of much promise.
263	"	Rev. J. Lizotte, St. Jean des Chaillons	Medium size, deep crimson, quality above medium, season winter.
264	"	Trappist Fathers, La Trappe	See full description.
265	Ont	Russell Hale, Orillia	Above medium size, yellow, splashed and washed with purplish red, quality good, season late winter, not of special merit.
266	"	John Bertram, Dundas............	Above medium size, pale yellow, splashed with bright purplish red, quality good, season early autumn, not sufficiently promising.
267	"	M. G. Bruner, Olinda	Medium size, pale yellow, well washed and splashed with bright red, quality medium, season October, handsome but not promising.
268	"	T. A. Harsant, Glen Orchard........	Very large, washed and splashed with purplish red, quality below medium, season late autumn to early winter.
269	"	W. J. Kerr, Renfrew...............	Large, green with splashes of purplish red, medium quality, season late autumn.
270	"	" "	Medium size, sweet, medium quality, not promising.
271	"	" "	Medium size, yellow with traces of purplish red, quality good but fruit not attractive, season early winter.
272	"	F. Ballantyne, Smiths Falls.........	Medium size, pale yellow, quality medium, season probably mid winter.
273	"	" "	Medium to below in size, bright red, quality good, season early winter, not large enough.

(Photo. by Frank T. Shutt.)

COVER CROP. HAIRY VETCH, CENTRAL EXPERIMENTAL FARM, SEPTEMBER 21, 1903. SOWN IN DRILLS, JUNE 18, 1903.

(Photo. by Frank T. Shutt.)

COVER CROP. HORSE BEANS, CENTRAL EXPERIMENTAL FARM, SEPTEMBER 13, 1903. SOWN IN DRILLS JUNE 18, 1903.

Record.	Province.	Address of Sender.	Description of Fruit.
274	"	C. A. Cass, L'Orignal..................	See full description.
275	"	Thos. Connolly, Lindsay	"
276	"	C. H. Snow, Cummings Bridge ...	'Sport' "
277	" ...	Daniel Lack, Lindsay...........	"
278	"	L. L. Livingston, Frankville.........	"
279	"	M. G. Bruner, Olinda....	"
280	"	J. Ballantyne, Ottawa East.........	"
281	"	David Francis, Perth................	Large, greenish yellow with a dull red blush, quality medium, season late winter.
282	"	C. Wallenshlager, New Edinburgh .	Medium size, yellow with a pink blush, quality medium, season early winter, not desirable.
283	"	" " ..	Above medium size, pale green with pinkish blush, quality good, season mid to late winter, may be promising.
			PEARS, PLUMS AND PEACHES.
284	"	R. B. Martin, Elmira................	Seedling pear, see full description.
285	"	W. J. Kerr, Renfrew................	" "
286	P.E.I....	H. E. Wright, Summerside..........	Seedling plum "
287	Ont.. ..	Samuel Greenfield, Ottawa East	No. 1, seedling plum "
288	"	" "	No. 2 " large, dark purplish red, medium quality, season early September.
289	"	W. J. Diamond, Belleville	Seedling plum, medium size, dark, purplish red, quality good, season early September.
290	"	W. K. Ireland, Owen Sound..........	Seedling peach, see full description.

No. 250—Seedling apple from Morley Small, Lawson, N.B.:—Size above medium to large; form roundish, conical, slightly angular; cavity shallow, medium width; stem short, stout; basin narrow, shallow, wrinkled; calyx partly open; colour greenish yellow well washed and splashed with red; dots fairly numerous, small, yellow, distinct; skin thick, tough; flesh yellowish, moderately juicy, mildly sub-acid; core medium; quality above medium; season mid to late winter.

Said to have originated from seed brought from England by Mr. Small's grandfather about eighty years ago. May be a promising late winter variety. Scarcely in condition for test yet, November 30, 1903.

No. 252—Apple: seedling, from Theodore Hanon, Mount St. Hilaire, Que.:—Size medium; form roundish conical; cavity medium depth and width, russeted, stem short, moderately stout; basin medium depth and width, slightly wrinkled; calyx partly open; colour pale yellow well washed with bright crimson; dots obscure; skin moderately thick, tender; flesh white tinged with red, juicy, tender, melting; core medium; mildly sub-acid, good flavour; quality very good; season evidently mid September.

A handsome apple and may be very useful as coming just before Wealthy.

No. 260—Apple seedling from R. Hamilton, Grenville, Que.:—Size above medium; form roundish; cavity medium depth, open, russetted; stem short to medium, stout; basin rather deep, medium depth and width, almost smooth; calyx open; colour pale greenish yellow well splashed and washed with rich purplish red; dots few, pale, indistinct; skin rather thick, tender; flesh yellowish, moderately juicy; core medium; sweet, sugary, pleasant flavour; quality good for a sweet apple; season evidently late September and October.

A handsome apple resembling Wealthy very much in outward appearance. October 16, still in good condition.

No. 264—Marlboro, seedling apple, from G. Reynaud, La Trappe, Que.:—Size large; form oblate; cavity deep, open, russeted at base; stem short, stout; basin, medium depth and width; calyx closed or open; colour pale yellow well washed with deep

crimson and with purplish red splashes; dots fairly numerous, pale yellow, distinct; skin moderately thick, rather tough; flesh white, tinged with red, tender, juicy; core medium; sub-acid, pleasant flavour, but slightly astringent; quality good. Season early to mid-winter.

Tree is quite hardy and is bearing well. A very handsome apple of about the same season as Fameuse and McIntosh Red. It is somewhat like Canada Baldwin in flavour, and may be a seedling of that variety, as it resembles it somewhat in other respects.

No. 274.—Apple from C. A. Cass, L'Orignal, Ont.:—Size, above medium; form, roundish, conical ,angular; cavity narrow, medium depth; stem short, moderately stout; basin narrow, shallow to medium; calyx open; colour pale yellow, well washed and splashed with crimson; dots obscure; skin moderately thick, rather tough; flesh white, tender melting, juicy; core medium size, open; mildly subacid, good flavour; quality good to very good; season probably January and February.

Tree bore in 1902 for the first time. Nearly a barrel taken off.

Probably a seedling of Fameuse. Lacks sprightliness. Same season as McIntosh Red and Fameuse.

No. 275.—Seedling apple from Thos. Connolly, Lindsay, Ont.—Size large ; form oblate; cavity medium depth and width; stem short, stout; basin medium depth and width, smooth; calyx open; colour pale greenish yellow, with traces of pink on sunny side; dots moderately numerous, indistinct, grey and green; skin thick, tough; flesh yellow, crisp, juicy; core medium; subacid, sprightly, pleasant flavour; quality good; season probably early to mid-winter. A promising seedling.

No. 276.—Apple 'Sport,' from C. H. Snow, Cummings Bridge, Ont.:—Size above medium to large; form oblate; conic; cavity deep, open; stem short, stout; basin medium depth and width, wrinkled; calyx closed; colour greenish yellow, almost covered with dark red; dots moderately numerous, yellow, distinct; skin thick, rather tough; flesh white tinged with red, crisp, juicy, tender; core small; flavour subacid, pleasant; quality good to very good. Season early to mid-September.

Thought to be a sport of St. Lawrence, which it resembles in shape, flesh, and somewhat in flavour. The flavour, however, does not seem to be as high as St. Lawrence. Promising. Tree fruiting among a number of St. Lawrence trees procured from same nursery.

No. 277.—Apple seedling from Daniel Lack, Lindsay, Ont.:—Size large; form roundish; cavity shallow, open; stem short, stout; basin medium depth and width, almost smooth; calyx closed; colour pale greenish yellow, almost greenish white, with a bright pink blush on sunny side; dots fairly numerous; flesh white, crisp, tender, juicy; core small; mildly subacid, pleasant flavour; quality good. Season evidently mid to late September. November 4, 1903, still in condition. A promising variety, resembling Princess Louise in appearance and quality, but earlier. Evidently a seedling of Fameuse.

No. 278.—Apple from L. L. Livingston, Frankville, Ont.:—Size medium; form oblate; cavity open, russeted; stem short, stout; basin deep, open, slightly wrinkled; calyx open; colour greenish yellow, splashed and washed with dull purplish red; dots few, grey, distinct; skin thick, rather tough; flesh yellow, crisp, moderately juicy; core small; subacid, pleasant flavour; quality good. Season late winter. Would be more promising if a little larger.

No. 279.—Apple from M. G. Bruner, Olinda, Ont.:—Size medium; form oblate to roundish, slightly angular; cavity deep, narrow, heavily russeted; stem medium length, slender; basin medium depth and width, smooth; calyx open; colour yellow, well splashed, washed, and streaked with purple red; dots obscure; skin moderately thick, tough; flesh white, tender, fairly juicy; core small; subacid, good flavour; quality good; season early to mid-winter. Scarcely large enough or juicy enough to be very promising, although it has considerable merit.

No. 280.—Apple from Jas. Ballantyne, Ottawa East, Ont.:—Size medium; form oblate, conic; cavity deep, medium width; stem short, fairly stout; basin narrow, very shallow; calyx partly open; colour pale yellow, splashed and streaked with purplish red; dots obscure; skin moderately thick, tough; flesh white, firm, crisp, moderately juicy, subacid; core medium; quality above medium. Season, late winter.

No. 284.—Seedling pear from R. B. Martin, Elmira, Ont.:—Fruit large, obovate, ovate, obtuse pyriform; colour yellow, with an orange blush; skin thin, tender; flesh yellowish, tender, melting, buttery; moderately sweet, not high flavoured; core small; quality good. Season, late September. Not high enough flavoured to be among the best varieties.

No. 285.—Seedling pear from W. J. Kerr, Renfrew, Ont.:—Fruit medium size, obovate, obtuse; colour yellow with a faint pink blush; stem medium length, stout; flesh yellowish, juicy, buttery, sweet but, not high flavoured; quality good; season evidently early September. Promising if hardier than Flemish Beauty. Seedling of Bartlett. Originated in the county of Leeds. Tree, 20 feet high.

No. 286.—Abegweit. Plum seedling from Henry E. Wright, Summerside, P.E.I.: —Form round oval; size large; cavity medium depth and width; suture distinct, slightly depressed; apex slightly depressed; colour yellow, well covered with deep red dots obscure; bloom none on specimens received; skin moedrately thin, rather tough; flesh yellow, juicy; stone medium to below medium, oval, flattened, cling; sweet, rich flavour; quality very good. A handsome plum and one worth propagating. Raised from stone of a plum from California. Bore first time this year. Tree a fast grower, very healthy and hardy so far. Ripens a few days later than Moore's Arctic and earlier than Lombard. Tree 6 or 7 years old from seed. Domestica group.

No. 287.—Plum seedling No. 1, from Samuel Greenfield, Ottawa East. Ont.:—Form roundish oval (broad); size large; cavity shallow; suture indistinct, no depression; apex rounded; colour dark purplish red; dots numerous, small, yellow; skin thin, tough; flesh greenish yellow, juicy, sweet; stone large, oval, cling; sweet, good flavour; quality good to very good. A plum of the Bradshaw type. Tree fruiting well this year. Promising. Domestica group.

No. 290.—Seedling peach from W. K. Ireland. Owen Sound, Ont.—Fruit large, roundish, colour yellow, well washed with deep red; suture distinct, depressed, deepest towards the apex; skin moderately thick; flesh yellow, juicy, sweet, rich, good flavour. Quality very good. Season mid September.

PEARS.

Although a few trees of named varieties of pears are still growing in the orchard, they are not at all satisfactory. Seedlings of Flemish Beauty and others are being grown, and it is hoped that some more blight resistant varieties may be obtained.

PLUMS.

As usual, nearly all the flower buds of European plums were destroyed by winter. The spring frosts did some injury to the flowers of native plums, but the Americanas were not affected, and the crop of the latter was an average one as regards quantity, but the quality was not as good as usual, owing to the drought which weakened the trees and caused some of the foliage to fall; to the aphis which were very difficult to control, and to the brown rot which caused much injury, notwithstanding frequent spraying which was offset by the wet weather during the latter part of the summer, making the conditions very favourable for the development of the disease.A bulletin on plum culture was published this year, giving the results of experiments with plums up to date.

One new experimental farm seedling was named this year, of which the following is a description:—

Welcome (seedling of DeSoto).—Fruit above medium size, oval, flattened considerably; cavity narrow, shallow; colour rich yellow more or less washed with red; dots very small, yellow, indistinct; bloom thin; skin moderately thick, fairly tough; flesh yellow, juicy, sweet, a pleasant but not rich flavour; quality good; season mid September. A very handsome plum. Tree vigorous and productive.

GRAPES.

Although the summer was cool and wet, the autumn was very favourable for the ripening of grapes, and 101 varieties matured this year. Among the newer varieties the Campbell's Early, which matures about the same time as Moore's Early, and is better in quality, is the best. For districts where the climate is like that at Ottawa, the following varieties are those which will give greatest satisfaction:—

Campbell's Early, Moore's Early, Moyer, Peabody, Wilder, Roger's 17, Delaware, Brighton, and Lindley. It is necessary to plant the last two among others, as they are not self fertile.

Several of Munson's hybrid grapes fruited this year. Of these the most promising is Manito, which is as early as Champion. The following description was made of it:—

Manito:—Vine medium growth, productive; fruit clusters below medium size, cylindrical, sometimes slightly shouldered and moderately loose; fruit below medium size, globular, black with a blue bloom; skin thin, fairly tender, somewhat acid; pulp very tender, melting, sweet, good flavour; quality good. As early as Champion. Promising for the north.

CHERRIES.

The cherry crop was a failure this year owing to the winter killing of the flower buds and to spring frost. There were only a few scattered cherries on a few trees. The Orel 25, is the hardiest in flower bud of all the varieties yet tested, as this has given fair crops when others have had little or none. Cherries, like European plums, will succeed well when grown near large bodies of water, when in the interior where the temperature does not fall any lower the flower buds are destroyed by winter.

STRAWBERRIES.

The strawberries wintered well and would probably have produced a fine crop but for the drought and spring frosts. As it was, the dry weather in April and May and until near the middle of June was very hard on the plants and they made little growth. The frosts of May 1 and 2, and particularly May 24 and 29, destroyed a large proportion of the flowers, the pistil being the part most injured. Many kinds set little or no fruit. The following table, in which are given the yields of the twenty-five most productive varieties, is instructive in that it shows which kinds were most resistant to the frost, but, as showing how much less was the yield of the most productive variety this year than last, the Mele, which was first, yielded 35 lbs. 6 ozs. in 1902, and the Lovett, which was 25th on the list, 20 lbs. 5½ ozs., while in 1903 the most productive variety, Jucunda Improved, yielded only 11 lbs. 15 oz., and the Young's seedling, which was 25th on the list, only 3 lbs. 11¼ oz. Of the 25 varieties which yielded best in 1903, 9 averaged best previous to 1903, and 10 were among the most productive 25 varieties in 1902.

For general market, the following are among the best:—Buster, P., Warfield, P., Beder Wood, B., Lovett, B., Sample, P., and for shipping long distances, the Williams, B. Other productive varieties for near market are: Bubach, P., Glen Mary, B., Greenville, P., and Haverland, P. The Clyde, B., is also a very productive berry, but as it has not very much foliage, is liable to scald, unless given high cultivation.

Name.	Bisexual Pistillate.	Date of full bloom.	Date of first ripe fruit.	Date of first picking.	Date of last picking.	Number of pickings.	Total Yield 1903. — Length of Rows, 30 ft. Lbs.	oz.
Jucunda Improved	B	May 29..	June 22..	June 24..	July 13..	8	11	15
Irene	P	" 27..	" 25..	" 27..	" 13..	7	10	4¾
Swindle	P	" 26..	" 27..	" 29..	" 13..	6	9	11½
Buster	P	" 26..	" 22..	" 24..	" 13..	7	9	8
Thompson's Late	P	" 29..	" 27..	" 29..	" 13..	6	9	5
Splendid	B	" 29..	" 22..	" 24..	" 10..	6	9	0
Daniel Boone	P	" 26..	" 22..	" 24..	" 13..	8	7	1
Gandy	P	" 29..	" 27..	" 29..	" 13..	6	6	12½
John Little	P	" 26..	" 22..	" 24..	" 13..	8	6	10
Dora	P	" 29..	" 22..	" 24..	" 13..	8	6	5¾
Lovett	B	" 26..	" 15..	" 21..	" 10..	9	6	4¾
World's Champion	B	" 29..	" 22..	" 27..	" 13..	7	6	1½
Vories	B	" 26..	" 15..	" 21..	" 10..	8	6	1
Wonderful	P	" 26..	" 22..	" 24..	" 13..	8	5	12
Brandywine	B	" 29..	" 27..	" 29..	" 13..	6	5	10½
Crescent	P	" 26..	" 19..	" 21..	" 13..	9	5	10
Williams	B	" 28..	" 15..	" 21..	" 13..	9	4	11½
Daisy	P	" 29..	" 24..	" 27..	" 10..	6	4	7¾
Carrie	P	" 26..	" 15..	" 21..	" 13..	9	4	7¼
Plover	P	" 28..	" 26..	" 27..	" 13..	5	4	5
Boynton	P	" 26..	" 22..	" 24..	" 13..	8	4	4¾
Howard's 41	P	" 26..	" 15..	" 21..	" 13..	8	4	4¼
Scarlet Ball	P	" 29..	" 27..	" 29..	" 13..	6	3	12¾
Beder Wood	B	" 26..	" 13..	" 21..	" 13..	9	3	11½
Young's Seedling	B	" 29..	" 15..	" 24..	" 13..	8	3	11¼

RASPBERRIES.

Raspberries have never been very productive in the horticultural department at the experimental farm, as the soil is a little too light for that fruit and the canes are not as strong as they would be if grown in heavier soil. The lightness of the soil, however, is perhaps an advantage in testing varieties, as one is better able to learn which kinds are best than if the soil were very rich and heavy, when the variations would not be so great.

The canes came through last winter in very good condition, but the drought and spring frosts lessened the crop somewhat.

In the following table will be found the average yields of the twelve most productive red varieties under test for the past four years. The Brighton, which heads the list, is one of Dr. Saunders' seedlings, and is a very hardy variety. The Cuthbert only averaged 4 lbs. ½ oz. This variety does not succeed as well as many others at the Experimental Farm.

Name of Variety. — Red Varieties.	Date of first ripe fruit, 1903.	Average date of first ripe fruit, 1900–03	Date of first picking, 1903.	Average date of first picking, 1900–03.	Date of last picking, 1903.	Average date of last picking, 1900–03.	Number of pickings, 1903.	Average number of pickings, 1900–03.	Total yield, 1903.		Average total yield, 1900–03.		Length of row, feet.
									Lbs.	oz.	Lbs.	oz.	
Brighton	July 1.	July 6.	July 2.	July 9.	July 27.	Aug. 4.	12	11	28	6½	19	10½	36
Kenyon	" 1.	" 10.	" 2.	" 12.	Aug. 10.	" 10.	16	12	16	14¼	16	7	36
Count	" 1.	" 6.	" 2.	" 9.	July 27.	" 3.	12	11	16	3	16	6¼	36
Henry	" 1.	" 5.	" 2.	" 9.	" 29.	" 2.	13	10	20	8½	16	0	36
Clarke	" 5.	" 9.	" 7.	" 12.	Aug. 10.	" 12.	13	13	12	12½	15	14½	36
Marlboro	" 5.	" 8.	" 7.	" 11.	July 31.	" 3.	11	11	9	9½	14	10	36
Phoenix	" 7.	" 11.	" 9.	" 15.	Aug. 20.	" 16.	15	13	11	10¼	14	6½	36
Herbert	" 7.	" 11.	" 9.	" 14.	" 13.	" 11.	14	11	14	12¼	12	4¾	36
Muriel	" 1.	" 7"	" 2.	" 9.	July 27.	" 4.	12	11	12	15½	12	1	36
Reliance	" 1.	" 6.	" 2.	" 9.	Aug. 10	" 9.	16	13	14	8½	11	14	36
Dora	" 9.	" 10.	" 11.	" 13.	" 10.	" 13.	12	12	9	2¾	10	3½	36
Brandywine	" 7.	" 13.	" 9.	" 15.	" 13.	" 19.	14	14	12	5¼	9	15¼	36

INDIVIDUALITY OF FRUITS.

The stock breeder has for a great many years paid especial attention to the individual animal in breeding for size, shape and markings, and for flesh and milk. In the writer's judgment, just as satisfactory results should be obtained in improving the strain of a variety of fruit, and although comparatively little has yet been done by horticulturists in this respect with fruits, much has been accomplished with flowers and vegetables. It is now recognized by the best authorities that each bud of a tree has individual characteristics which separate it from all other buds, and although the differences in buds are in most cases so slight that it is impossible to detect them, yet in some instances they may be quite marked.

Fruit growers have often noticed that one tree or bush is more productive than another, or bears larger, more highly coloured or better flavoured fruit. Take as an example the Fameuse apple. When this excellent old variety first bore fruit several hundred years ago one tree produced all the Fameuse apples that there were at that time. Some apples on that original tree were probably not as highly coloured as others, although exposed to the same amount of light. Some branches, probably, were more heavily laden than others, although there was no apparent reason why they should be. On some branches the fruit was larger though as well loaded as others. In time, scions were cut from that tree and grafted, and a new generation of Fameuse trees was the result. Were the trees thus produced identical in vigour and productiveness, and was the fruit borne on each of them exactly similar in every respect? We believe that they were not. Every bud on every tree of every generation of Fameuse apple trees had individual characteristics, and although the differences were rarely enough marked to see, there were doubtless always fine shades of variation. It does not need a great stretch of imagination to see that if such changes can be made, as have been made in live stock, flowers, vegetables, and other economic plants, by careful selection, that if, when that first generation of Fameuse apple trees began to bear, scions had been taken from the most productive tree bearing the finest coloured apples of the best size, that in the next generation of trees there would be at least a slight improvement, and if this selection had been carried on down to the present time we should have a better Fameuse than we have to-day. This selection, however, has not been carried out, and about all that has been done, in a few cases, is to graft from trees bearing highly coloured fruit, but as yet we have practically no reliable information in Canada as to

whether the results have been satisfactory. In small orchards, where the fruit is intended for home consumption, the individuality of different trees is more noticed than in large orchards, where the record of each tree is not brought so prominently before the grower. The effect of the stock on the productiveness of the tree and characteristics of the fruit is not yet well understood. Whatever may be the influence of the stock there is no doubt that each variety maintains most of its individual qualities.

At the Central Experimental Farm the yields are kept from each individual tree in the orchard, making it possible to tell at the end of a certain period just what each tree has borne. It has been found that trees planted at the same time, and growing under practically the same conditions as other trees of the same variety, vary widely in productiveness. Some trees also bear a medium crop every year, while others bear a heavy crop every other year.

In the following table will be found the yields of trees of four varieties of apples for the past six years, with the total yield per tree for that time. It will be seen that some trees have yielded two to four times as much as others. The yield is given in gallons rather than in barrels, to avoid large fractions.

It is worth mentioning that of the 17 Wealthy trees in the table only 7 bore fruit this year, and of those that fruited, the tree which had borne regularly during the past four years, again bore a good crop in 1903.

APPLES—WEALTHY.
(Planted 1896.)
Yield in Gallons.

Tree.	1899.	1900.	1901.	1902.	1903.	Total.
1	1·0	2·25	2·75	15·0	....	21·00
2	2·0	·5	2·5	12·0	....	17·0
3	1·75	12·0	2·25	8·0	....	24·0
4	9·0	2·25	15·5	20·5	27·0	74·25
5	7·5	6·5	7·75	23·0	7·5	52·25
6	3·25	6·5	3·5	24·0	....	37·25
7	7·5	1·0	10·0	19·0	16·0	53·5
8	....	8·5	·5	21·5	....	30·5
9	....	11·25	·25	27·5	....	39·0
10	1·0	12·25	....	30·0	....	43·25
11	1·25	11·25	....	21·5	....	34·0
12	....	7·5	....	18·5	2·0	28·0
13	4·25	6·25	4·5	20·0	·5	35·5
14	2·5	5·5	·5	34·0	....	42·5
15	....	2·25	3·5	21·5	8·5	35·75
16	3·0	2·25	4·0	22·5	4·5	36·25
17	....	2·0	1·0	22·5	....	25·5

APPLES—MCMAHON WHITE.
(Planted 1888.)
Yield in Gallons.

Tree.	1898.	1899.	1900.	1901.	1902.	1903.	Total.
1	62·0	....	83·0	2·0	147·0	1·5	295·5
2	42·0	1·0	6·0	12·5	98·0	23·0	182·5
3	32·0	29·0	49·0	18·0	55·0	63·5	246·5
4	35·0	....	34·5	4·0	63·0	34·0	170·5
5	....	37·5	55·0	49·0	....	61·0	210·5
6	29·0	4·5	46·0	·5	69·5	43·0	192·5
7	·5	9·5	19·5	4·0	19·0	39·5	92·0
8	7·0	9·0	27·0	9·0	53·0	15·5	120·5

Apples—McIntosh Red.

(Planted 1890.)

Yield in Gallons.

Tree.	1898.	1899.	1900.	1901.	1902.	1903.	Total.
1	17·5	26·0	37·0	6·5	71·5	94·0	252 5
2	1·0	9·5	10·5	1·0	37·5	31·0	90·5

Apples—Patten's Greening.

(Planted 1892.)

Yield in Gallons.

Tree.	1898.	1899.	1900.	1901.	1902.	1903.	Total.
1	27·0	2·0	35·0	1·5	71·0	15·0	151·5
2	2·0	6·0	14·0	19·0	24·0	55·5	120·5
3	2·0	31·0	1·5	40·5	22·0	67·0	164·0
4	13·0	·0	6·5	·0	12·0	15·0	46·5
5	1·0	·0	19·0	·5	17·5	21·0	59.0

Experiments are now being conducted at the Experimental Farm by top grafting with scions from productive and unproductive trees, to determine how far the productiveness and unproductiveness of the trees is constant. Root grafted trees are also being grown for this purpose.

In order that fruit growers might learn, by personal experience, of the great variation in individual trees of the same variety, a co-operative experiment was begun this year. On application to the horticulturist, six pieces of zinc, bearing six consecutive numbers, were sent to each person. These pieces of zinc when received were to be attached to six bearing trees of a single variety of apple, pear, plum, or peach, the trees to be the same age, and growing under the same conditions of soil and culture. A record of the yield of each tree was to be kept for at least five years. A number of fruit growers in different parts of Canada have already joined this co-operative test, and it is hoped that more persons will desire to take part in this experiment.

If scions from productive trees will produce productive trees when grafted, and if scions from unproductive trees will produce trees which are poor croppers, it is very important that scions should be taken from the best yielding trees. As grafting will, in all probability, become much more general among fruit growers in the near future, the importance of knowing that trees vary widely in productiveness is easily seen.

SPRAYING.

The spraying of fruit trees is not becoming as general as its importance deserves. The good results and profits from spraying have been proven over and over again, and yet only a small percentage of farmers with orchards spray their trees. The following is a statement made by Mr. Jos. Tweddle, of Fruitland, Ont., this year:—

'I have some 25 or 30 acres of apple orchard in bearing, mostly Greening, Spy and Baldwin. I figure on spraying three times a year, and estimate each spraying as adding a thousand dollars to the value of my crop. This is no mere guess work either.

The accuracy of the figures has been demonstrated, when owing to unfavourable weather conditions I have been unable to complete the work at the proper time. By spraying three times, I have got from 80 to 90 per cent of No. 1 apples from my total crop. I have sold 15 cars of apples of my own production in Germany, which have netted me \$3 for No. 1, and \$1.25 to \$2 for No. 2.'

Spraying is now such an essential factor in successful orcharding, that the most economical means of applying the mixtures and solutions are being sought for. While the ordinary barrel pump is sufficient for smaller orchards, the power sprayer is evidently going to take its place in large orchards. Up to the present time compressed air sprayers appear to have given the best satisfaction, although gasoline engines have given very satisfactory results. In a demonstration of power spraying given by the Fruit Division of the Commissioner's branch with a gasoline engine, it was shown that it could do good work in spraying orchards. Mr. Jos. Tweddle, of Fruitland, Ont., used compressed air, which he said was also very satisfactory.

As a rule, the greater the number of sprayings, up to five or six, the better the results will be, but if a farmer or fruit grower finds it impossible to spray more than three times, the early sprayings are decidedly the most important. Although this is especially true in spraying to prevent the apple spot fungus, it is also true with other diseases.

The following formula is that recommended at the Central Experimental Farm for fungi on fruit trees:—

Poisoned Bordeaux Mixture for Fungi and Leaf-eating Insects on Fruit Trees.

Copper sulphate (bluestone)	4 lbs.
Unslaked lime	4 lbs.
Paris green (for leaf-eating insects)	4 oz.
Water (1 barrel)	40 gals.

Dissolve the copper sulphate in hot water, or by suspending it in a coarse bag in a wooden or earthen vessel containing 4 or 5 or more gallons of water. Slake the lime in another vessel. If the lime, when slaked, is lumpy or granular, it should be strained through coarse sacking or a fine sieve. Pour the copper sulphate solution into a barrel, or it may be dissolved in this in the first place; half fill the barrel with water; dilute the slaked lime with 8 or 10 gallons of water, and pour it into the copper sulphate solution, then fill the barrel with water and stir thoroughly. It is then ready for use. Do not pour the undiluted slaked lime into the undiluted copper sulphate solution, or vice versa, as when mixed in this way a poor, flakey Bordeaux mixture which settles rapidly is the result. A stock solution of copper sulphate and lime wash may be prepared and kept in separate covered barrels throughout the spraying season. The quantities of copper sulphate, lime and water should be carefully noted. Further particulars regarding other spraying mixtures and solutions may be found on the spraying calendar, which will be sent on application.

DUST SPRAYING.

In the western states, particularly in the state of Missouri, where orchards are often on steep hillsides, and where water is sometimes scarce, fruit growers have been looking about for some easier way of applying fungicides and insecticides than by means of water, which is difficult to get, and more difficult to draw over the rough ground. Trees have been dusted with sulphur and other materials in the past, but copper sulphate had not been generally used in this way until tried in the west. Machines for spraying dust mixtures have been invented or old ones improved upon, and during the past few years dust spraying has been carried on in a number of commercial orchards in the western states, and quite satisfactory results have been obtained. Air slaked lime has been used in the place of water for carrying the fungicides and insecticides, although it, in itself, to a certain extent is both.

The formulæ recommended up to the present year were not entirely satisfactory, as they did not contain the copper in the same chemical condition as in Bordeaux mixture. Experiments were conducted by the chemist of the Missouri Experiment Station, and a dust is now recommended which is said to have the copper in the right chemical condition. The formula, with methods of preparation, is given in Bulletin No. 60, Missouri Experiment Station, Columbia, Mo., U.S.A.

A dust machine was obtained from the Ozark Sprayer Company, Springfield, Mo., and tested at the Experimental Farm this year. It was found to distribute the dust satisfactorily, but in order to get the dust to adhere to the leaves it must be applied when the dew is on the foliage. This is a serious drawback to dust spraying in this time of scarcity of labour. Moreover, the liquid spray gives such satisfactory results when properly made and applied, that the dust spray is not likely to take its place, except, perhaps, where the ground is rough, or where the orchards are on steep hillsides.

It would appear at first that there was great danger from the use of arsenical poisons when applied in a dust spray, but while there is undoubtedly danger if the dust is inhaled, the nozzle is so far away from the operator that there is really little or no danger if the work is carefully done.

DISEASES OF FRUITS.

There are a few diseases of fruits which cause much more loss than others, and although these have already been discussed and remedies recommended many times, one cannot too often refer to them, as the endeavour to prevent and control them is by no means general yet.

Apple spot fungus.—The apple spot fungus, or apple scab, is still one of the commonest diseases in Canadian orchards, but it is one of the easiest to control, as the Bordeaux mixture, if thoroughly applied at the proper times, is very effectual. The most important sprayings are: 1st, just before or as buds start to develop; 2nd, just before blossoms open; 3rd, as soon as possible after blossoms fall. Also 4th, 5th, and even 6th, sprayings at intervals of ten days to two weeks after the 3rd spraying, if the first sprayings are not sufficiently effective.

In 1903 the spot was not as bad as usual, probably owing to the dry weather in spring and early summer, which was unfavourable to the development of spores. In eastern Ontario and most of the province of Quebec there was practically no spot, and the fruit was cleaner than it has been for years. Spraying should be thoroughly done in 1904, so as to endeavour to keep this fungus under better control, now that it has received a check. The experience of this year shows the importance of early spraying. Although the summer was a very wet one after the middle of June, no spot developed in the east.

Ripe rot, brown rot.—This disease does great injury every year to the peach and plum crop. It is not as easily controlled as the apple spot, but thorough spraying has been found very effectual. The ripe rot spreads by means of spores, which germinate early in the spring and penetrate the twigs from the leaves and flower buds on which they alight. In order to destroy as many of the spores as possible, all diseased fruit should be gathered and burned, whether it is on the ground or on the tree. This fruit harbours myriads of spores, which endure the winter, and are capable of infecting the trees the following spring. The trees should be thoroughly sprayed in time to destroy the spores before the disease penetrates the wood in the spring. The first spraying should be made with poisoned Bordeaux mixture, or a sulphate of copper solution, 1 pound sulphate of copper to 25 gallons of water, shortly before the buds start to develop, and with poisoned Bordeaux mixture just before the blossoms open. These sprayings are very important, and should never be neglected. After the trees have bloomed they should be thoroughly sprayed again with ordinary poisoned Bordeaux

mixture, and also ten days to two weeks before the fruit begins to colour. The trees should also be sprayed with ammoniacal copper carbonate solution when the fruit is beginning to ripen. This will destroy the spores which appear in great numbers on the mature plums, and will not discolour the fruit. Plums and peaches which touch one another on the tree give very favourable conditions for the spread of the disease from one fruit to another. Being close together, moisture is retained on the skin, and the spores which may be on one fruit germinate readily and soon infect the next, and thus the disease spreads rapidly. Thinning the fruit makes the conditions much less favourable for the development of the disease. Also discoloured and dead wood should be cut out and burned in the meantime. If spraying is thoroughly done the injury from this disease will be much lessened.

Peach-leaf curl.—The leaf curl has been very troublesome in peach orchards during recent years, but it has been so well proven that it can be kept under control by spraying that peach growers need not now suffer much from this disease. The presence of the leaf curl is known early in the spring by the abnormal curling and swelling of the peach leaves. There is also frequently a whitish bloom accompanying these symptoms. Two early applications of Bordeaux mixture, if thoroughly applied, are all that are necessary; the first after the flower buds begin to swell and before they open, and the second, just after the blossoms fall.

Black rot of the grape.—Fruit growers in the south-western part of Ontario along Lake Erie are becoming discouraged in their efforts to grow profitable crops of grapes, owing to the prevalence of black rot fungus, which has done great damage there in recent years, and was again very bad in 1903, causing almost or quite a total loss of crop in some vineyards. This disease is very difficult to control, especially when it has gained such a foothold as it has in the south-western peninsula, but it can be controlled by spraying regularly year after year, as has been proven by experiments which have been made and by the results obtained by some commercial growers. The price obtained for grapes in Ontario is now so low that Canadian growers hesitate to spray as frequently as is recommended, and hence the disease is not checked. It has been found necessary to spray six or seven times in order to check the rot immediately. The first spraying should be made with a sulphate of copper solution (1 lb. of sulphate of copper to 25 gallons of water) before the bursting of the buds. The second spraying should be with poisoned Bordeaux mixture before the flowers open. This is a very important spraying, and if neglected may mean great loss from the rot. The third spraying should be made with poisoned Bordeaux mixture just after the blossoms fall, and the fourth spraying with the same mixture about two weeks later. There should then be from two to three sprayings with the ammonical copper carbonate solution at intervals of about two weeks.

COVER CROPS.

Cover crops are now recognized to be so essential to the most successful culture of large fruits that it might seem like repetition to deal with them again, were it not for the fact that new information is being constantly obtained at the Central Experimental Farm as to the methods of growing these crops, to the kind of plants used for this purpose, to their relative value as plant food, and to their effect on the moisture content of the soil. Information regarding plant food and moisture-content will be found in the report of the Chemist, who has taken many samples for analysis from the orhcard.

The main uses of the cover crop in the orchard are: to hold the snow in winter and to protect the roots of the trees; to furnish vegetable matter to plough under in the spring for the purpose of obtaining humus and nitrogen, and to act as a catch crop in autumn to prevent leaching of plant food made available during the summer. Much has been written in former reports regarding the value of clover as a cover crop. The experiments this year were made to test other plants grown in a different way.

It is sometimes difficult to get a good stand of clover in the autumn, owing to dry weather after seeding time, and as in the north especially it is very desirable to have the cover crop as tall as possible so that it will hold the snow, some methods of ensuring a good growth were thought of, and it was decided to try growing a cover crop in drills. By adopting a plan of this kind it was thought that the seed could be sown comparatively early, and when it germinated the soil between the rows could be cultivated until the usual time, and thus conserve almost as much moisture as if the ground were bare, and yet a good cover crop would be sure to be established.

The kinds of plants used were horse beans, soja beans and hairy vetch, the two former being planted with the object of having something that would grow tall and hold the snow well. It was also observed in former years that the horse bean stood several degrees of frost, which is an advantage.

The seed was sown at two different dates, the object being to learn when was the best time for the purpose intended. All received two cultivations.

Horse beans: 1st sowing June 18. Sown at the rate of one bushel per acre, in rows 28 inches apart. These germinated well and grew rapidly, the cool weather of the past summer appearing to suit them well. By July 28, the plants were from 15 to 18 inches high, and were beginning to bloom. On September 21, a plot four feet square was cut, and the yield when still green was found to be at the rate of 7 tons 733 lbs. per acre. At this time the plants were 3 feet 6 inches to 4 feet in height, and in some places 4 feet 6 inches high, and although the ground between the rows was not covered with foliage, it was nearly so. The plants at this time were still growing and blooming profusely, and pods were well formed to a height of 2 feet 6 inches from the ground. By October 6 some of the plants were 5 feet in height. It was not until October 26 that the plants were much injured by frost, but they remained alive near the ground until the winter set in, November 16. At this time, November 30, the plants are standing up well, and it is expected they will hold the snow admirably. In the spring they will be harrowed or ploughed in, when, being leguminous plants, they will add much nitrogen to the soil.

Horse beans: 2nd sowing.—Sown June 26, at the rate of one bushel per acre in rows 28 inches apart. Up July 5. On September 21, the plants were 3 feet 6 inches in height. They were not so well podded as the first sown, but were healthy, in full bloom, and podded to a height of 2 feet 2 inches, and growing vigorously. Although not as tall as the first sown plants, they were tall enough to hold the snow well.

Horse beans: 3rd sowing. Sown July 7 at the rate of one bushel per acre in rows 28 inches apart. The plants reached a height of 3 feet and more, and should hold the snow well. They bloomed freely and pods were well formed before winter.

Soja beans: 1st sowing.—Sown June 18, at the rate of 37½ lbs. per acre in rows 28 inches apart. Owing to the cool summer, the soja beans did not make as rapid growth as they would otherwise have done, as they require plenty of heat, but the fall being warm they had good time to develop. On September 21, a plot four feet square was cut and the green crop found to weigh at the rate of 7 tons 350 lbs. per acre. At this time the plants were 2 feet to 2 feet 3 inches in height, and meeting between the rows in most places. The plants were well podded and still growing thriftily. At the first light frost, however, they were killed, as the Soja bean is very tender. The Soja bean should hold the snow well this winter, and will be valuable for turning under in spring.

Soja beans: 2nd sowing. Sown June 26 at the rate of 37½ lbs. per acre in rows 28 inches apart. Up July 2. On September 21, the plants were from 2 feet to 2 feet 3 inches in height and meeting between the rows in most places. The pods were not so well matured as the first sown, but otherwise there was very little difference between them.

Soja beans: 3rd sowing.—Sown July 7 in same manner as the others. By September 21, the plants were 2 feet to 2 feet 3 inches in height, having grown rapidly.

Vines were about as large as those of the first and second sowings, but the pods were not as well developed. This sowing was on warmer soil, which accounts for the rapid growth.

Hairy vetch: 1st sowing. Sown June 18 at the rate of 20 lbs. per acre and in rows 28 inches apart. The seed germinated well, and by the end of the first week of August the plants were meeting between the rows. On September 21, the length of the vines was 3 feet to 3 feet 6 inches in length. The vines formed a perfect carpet, and it was impossible to distinguish the rows. At this date a plot four feet square was cut, and the green crop was found to weigh at the rate of 11 tons 1,895 lbs. per acre. The Hairy Vetch continued to grow up to the time winter set in on November 16, only a few leaves here and there being injured by the earlier frosts. It had not begun to bloom when the growth was checked by winter. The Hairy Vetch will not hold the snow as well as the horse beans, but as it forms such a thick mat on the ground, the frost will probably not be so deep as where horse beans and Soja beans were grown; it makes a perfect mulch and will prevent thawing and freezing to a large extent. Furthermore, it is rich in plant food and is very valuable for turning under. The Hairy Vetch as a cover crop is a keen rival of red clover in this district, and under some conditions, such as where there is rough ground, will give better satisfaction.

Hairy Vetch: 2nd sowing.—Sown June 26, at the rate of 20 lbs. per acre, in rows 28 inches apart. Up July 2. By September 21 this had formed a thick mat, and the rows could not be distinguished, although the mat was not as thick as where the vetch was sown earlier. The vines at this date were 2 feet 6 inches to 3 feet in length. The cover was very satisfactory at this date, and by winter it was much better.

Hairy Vetch: 3rd sowing.—Sown August 7 in the same manner as at previous times. By winter the vines had formed a good mat, though this was not thick enough to be perfectly satisfactory, and as the autumn was favourable for growth this is a little too late to plant the hairy vetch as a cover crop here.

Cost per acre of seed of cover crops, sown in drills, 1903.

Horse beans: 60 lbs. at 3½ cents per lb.	$2 00
Soja beans: 37½ lbs. at 9 cents per lb.	3 37½
Hairy vetch: 20 lbs. at 9½ cents per lb.	1 90

Common red clover sown broadcast, 12 lbs. per acre at 14 cents per lb. costs $1.68.

LIST OF BEST VEGETABLES FOR FARMERS.

The list of best vegetables for farmers was omitted last year, as there were few changes to make. There are some changes to make this year, and as such lists are liable to get lost it is thought best to publish it again. Furthermore, owing to the limited number of pages available for reporting on the tests made, it is not possible to go into details with many kinds of vegetables. The following list gives in a concise form the names of the varieties considered best after many years' tests:—

Asparagus.—Conover's Colossal is the best all-round variety, but this variety is more subject to rust than Palmetto or Argenteuil.

Beans.—Keeney's Rustless Golden Wax, or Wardwell's Kidney Wax, for early crop; Early Refugee, for medium; and Refugee or 1,000 to 1, for late crop, are the most satisfactory dwarf varieties. Asparagus, Lazy Wife and Old Homestead are three of the best pole varieties.

Beets.—Egyptian Turnip, Eclipse and Bastian's Blood Turnip are three of the best varieties.

Borecole or Kale.—Dwarf Green Curled Scotch is the best.

Broccoli.—White Cape.

Brussels Sprouts.—Improved Dwarf is the most satisfactory.

Cabbage.—Early Jersey Wakefield (early), Succession (medium); Late Flat Dutch, Drumhead Savoy (late), Red Dutch (red), is a select list of the best varieties of cabbage. For extra early use Paris Market is desirable, being a week earlier than Early Jersey Wakefield.

Cauliflowers.—Extra Early Dwarf Erfurt and Early Snowball.

Carrots.—Chantenay is one of the best, but if a good extra early sort is required, the Early Scarlet Horn can be planted with advantage. It is a small variety.

Celery.—Golden Self-Blanching (Paris Golden Yellow), Improved White Plume, White Walnut (early); Perfection Heartwell, White Triumph, London Red (late), are among the best.

Corn.—Early Fordhook, Early Cory (early); Crosby's Early, Henderson's Metropolitan (second early); Perry's Hybrid, Stabler's Early, Early Evergreen, and Black Mexican (medium); Stowell's Evergreen, Country Gentleman (late). In planting, the Country Gentleman should not be omitted, as it lengthens the season very considerably, and is of fine quality.

Cucumbers.—Peerless White Spine or White Spine, Cool and Crisp, and Giant Pera are three of the most satisfactory slicing varieties. Boston Pickling is a good pickling sort.

Egg Plants.—New York Improved and Long Purple succeed best.

Lettuce.—Black Seeded Simpson, The Morse, and New York (curled), Improved Salamander, Unrivalled, Tennis Ball and Golden Queen (cabbage); Trianon and Paris Cos lettuce.

Melons, Musk.—Long Island Beauty, Hackensack and Montreal Market, of the Nutmeg type, and Surprise, Christiana and Emerald Gem, of the yellow fleshed types, are all good.

Melons, Water.—Cole's Early, Imperial, Ice Cream, and Phinney's Early are early water melons of excellent quality.

Onions.—Yellow Globe Danvers and Large Red Wethersfield are two of the best onions in cultivation.

Parsnips.—Hollow Crown and Dobbie's Selected are both good sorts.

Parsley.—Double Curled is as good as any.

Peppers.—Cayenne, Cardinal, Chili and Golden Dawn are four of the best.

Pease.—Gregory's Surprise, Gradus, American Wonder and Premium Gem (early); McLean's Advancer, Nott's New Perfection, and Heroine (medium). None of these are tall growing varieties. Stratagem, Juno (dwarf), Telephone (late). Excelsior is a promising second early sort.

Potatoes.—Extra Early: Early Ohio and Early Andes (pink), Bovee and Burpee's Extra Early (pink and white). Early: Everett and Rochester Rose (pink), Early Puritan (white). Main crop: Carman No. 1 (white), Empire State (white), Late Puritan (white), American Wonder (white), Dreer's Standard (white), Rural Blush (pink).

Radishes.—Early: Scarlet White-tipped Turnip, Rosy Gem, French Breakfast, Red Rocket (red) and Icicle (white). Late: White Strasburg, Long White Vienna. Winter: Long Black Spanish, Chinese Rose-coloured.

Rhubarb.—Linnæus and Victoria are the most satisfactory.

Salsify.—Long White and Sandwich Island.

Spinach.—Victoria and Thick-leaved are the best.

Squash.—Early: White Bush Scalloped and Summer Crook Neck. Late: Hubbard.

Tomatoes.—Early: Sparks' Earliana. Main crop: Brinton's Best, Trophy, Matchless (scarlet) and Burpee's Climax and Autocrat (purplish pink).

There are many varieties of tomatoes which are almost equal in excellence and productiveness.

Turnips.—Early: Extra Early Milan and Red Top Strap Leaf. Swedes: Champion Purple Top, Skirving's Improved.

POTATOES.

Although the crop of potatoes was not as good as last year owing to the extremely dry weather in the early part of the summer, the largest yield, which was given by the Dreer's Standard, was at the rate of 534 bushels 36 lbs. per acre, and the lowest yield, that of the Red Rock, was only 19 bushels 48 lbs. per acre, a difference between highest and lowest in the 97 varieties under test of 514 bushels 48 lbs. per acre, which shows the great importance of planting only the most productive kinds.

The potatoes were planted in good sandy loam soil, which had been well manured for tobacco the previous year. The soil was ploughed in the fall and again in the spring and thoroughly harrowed with disc and smoothing harrow shortly before planting. Drills 2½ feet apart and about 4 inches deep were opened with the double mould board plough, and 66 sets of each variety were planted 1 foot apart in a single row. The sets were of good size, having at least three eyes and a liberal amount of flesh. The sets were injured somewhat by the dry weather and did not grow as evenly as usual. In some of the experiments, particularly in a spraying experiment, the sets came up too unevenly to get accurate results, hence these are omitted this year. The soil was harrowed once before the potatoes were above ground, to kill weeds, and then kept loose with the cultivator until the vines met. The potatoes were kept thoroughly sprayed to prevent injury from potato beetles and blight. The potatoes were planted on May 22, and dug on October 5 and 6.

POTATOES—Test of Varieties.

No.	Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Un-marketable.		Colour.
1	Dreer's Standard	Good	534	36	508	12	26	24	White.
2	Carman No. 1	"	514	48	490	36	24	12	"
3	Late Puritan	"	473	0	433	24	39	36	"
4	Bergeron	Medium	464	12	440	0	24	12	White, pink eye
5	Canadian Beauty	Good	451	0	402	36	48	24	Pink and white.
6	Dakota Red	Medium	442	12	398	12	44	0	Red.
7	Rural Blush	Good	440	0	411	24	28	36	Pink.
8	Dr. Maercher	Medium	429	0	391	36	37	24	White.
9	Clay Rose	"	418	0	387	12	30	48	Pink.
10	Burnaby Seedling	Good	418	0	376	12	41	48	Pink and white.
11	Burnaby Mammoth	"	415	48	385	0	30	48	" "
12	American Giant	Medium	411	24	341	0	70	24	White.
13	Flemish Beauty	Good	402	36	360	48	41	48	Bright pink.
14	Rose No. 9	Medium	398	12	385	0	13	12	Pink.
15	Money Maker	Good	396	0	367	24	28	36	White.
16	Uncle Sam	"	393	48	367	24	26	24	"
17	Everett	"	393	48	356	24	37	24	Pink.
18	State of Maine	"	387	12	363	0	24	12	White.
19	Peachblow	Medium	385	0	341	0	44	0	"
20	Troy Seedling	"	374	0	330	0	44	0	"
21	Seattle	"	371	48	334	24	37	24	"
22	Cambridge Russet	Good	369	36	336	36	33	0	"
23	I. X. L.	"	367	24	334	24	33	0	Pink and white.
24	Enormous	"	363	0	330	0	33	0	White.
25	Vanier	Poor to med.	358	36	323	24	35	12	Red.
26	Seedling No. 7	Medium	356	24	332	12	24	12	Bright pink.
27	Rural No. 2	Good	352	0	321	12	30	48	White.
28	Penn. Manor		347	36	323	24	24	12	Pink and white.
29	Country Gentleman		347	36	303	36	44	0	White.
30	Dooley		341	0	330	0	11	0	
31	Irish Cobbler	Good	338	48	299	12	39	36	White.
32	Pearce	"	334	24	301	24	33	0	Pink and white.
33	Sabean's Elephant	"	330	0	299	12	30	48	White.
34	Mammoth Pearl		319	0	310	12	8	48	"
35	Burpee's Extra Early	Good	319	0	283	48	35	12	Pink and white.
36	Doherty's Seedling	"	316	48	297	0	19	48	White.
37	Lee's Favorite	"	312	24	297	0	15	24	Pink.
38	Early Norther	"	310	12	264	0	46	12	"
39	Brown's Rot Proof	Medium	305	48	272	48	33	0	"
40	Swiss Snowflake	Good	305	48	268	24	37	24	White.
41	Rochester Rose	"	305	48	246	24	59	24	Pink.
42	Delaware	"	301	24	233	12	68	12	White.
43	Vick's Extra Early	"	299	12	270	36	28	36	Pink and white.
44	New Queen	"	292	36	264	0	28	36	" " "
45	Early Elkinah	"	292	36	259	36	33	0	Pink.
46	Northern Beauty		292	36	257	24	35	12	
47	Crimes Lightning		290	24	279	24	11	0	
48	Irish Daisy	Good	288	12	270	36	17	36	White.
49	Jubilee	"	286	0	257	24	28	36	Pink and white.
50	Early Envoy		283	48	257	24	26	24	
51	White Elephant		281	36	266	12	15	24	Pink and white.
52	Montana Bluff		279	24	255	12	24	12	White, bright pink eye.
53	Quaker City		272	48	242	0	30	48	White.
54	Reeve's Rose	Good	272	48	233	12	39	36	Pink.
55	Early Ohio	"	268	24	233	12	35	12	"
56	Sir Walter Raleigh		268	24	233	12	35	12	White.
57	Early Michigan		268	24	204	36	63	48	"
58	Maule's Thoroughbred		266	12	222	12	44	0	Pink.
59	Holborn Abundance	Medium	261	48	253	0	8	48	White.
60	Green Mountain	Good	259	36	222	12	37	24	"
61	Carman No. 3	"	253	0	228	48	24	12	"
62	McIntyre	Medium	253	0	228	48	24	12	White and purple.
63	Napoleon	Good	246	24	222	12	24	12	Pink.
64	Maggie Murphy	Medium	242	0	209	0	33	0	Bright pink.
65	Snowball		242	0	195	48	46	12	White.

POTATOES—Test of Varieties—*Continued.*

No.	Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Un-marketable.		Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
66	Livingston		242	0	200	12	41	48	White, pink eye.
67	Burbank's Seedling	Good	239	48	189	12	50	36	White.
68	Wonderful		231	0	204	36	26	24	
69	Brosseau		224	24	198	0	26	24	Red and white.
70	Polaris	Good	215	36	187	0	28	36	White.
71	Dublin Prize		213	24	178	12	35	12	
72	Early Rose	Good	209	0	169	24	39	36	Pink.
73	Rawdon Rose		202	24	184	48	17	36	Pink and white.
74	Wall's Orange		200	12	178	12	22	0	Yellow, purple eye
75	Sharpe's Seedling	Good	193	36	162	48	30	48	Pink and white.
76	Juana		191	24	149	36	41	48	
77	Early Puritan	Good	189	12	149	36	39	36	White.
78	Van Orman's Earliest		184	48	173	48	11	0	
79	Empire State	Good	180	24	165	0	15	24	White.
80	General Gordon	"	180	24	154	0	26	24	Pink.
81	Up-to-Date	"	180	24	154	0	26	24	White.
82	Pink Eye		180	24	136	24	44	0	White, bright pink eye.
83	American Wonder	Good	169	24	143	0	26	24	White.
84	Early Sunrise	"	169	24	129	48	39	36	Pink.
85	Prolific Rose		162	48	134	12	28	36	Pink.
86	Eureka Extra Early		162	48	129	48	33	0	
87	Seedling No. 2. (D. Murray)		162	48	101	12	61	36	
88	Bliss Triumph		140	48	103	24	37	24	Red.
89	Early St. George	Good	121	0	107	48	13	12	Pink and white.
90	Silver Dollar		114	24	83	36	30	48	White.
91	Bovee	Good	103	24	88	0	15	24	Pink and white.
92	Early Summer		85	48	77	0	8	48	" "
93	Early White Prize	Good	57	12	57	12			White.
94	Pingree		37	24	28	36	8	48	
95	Early Andes	Good	33	0	19	48	13	12	Pink.
96	Pat's Choice		30	48	26	24	4	24	
97	Red Rock		19	48	19	48			Red.

ADDITIONAL VARIETIES OF POTATOES TESTED IN 1903.

The following varieties, some of which were sent for test, were grown in smaller plots:—

Name of Variety.	Number of Sets Planted.	Total Yield per Acre.		Yield Per Acre of Marketable.		Yield per Acre of Unmarketable.	
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Morgan seedling	20	522	43	450	7	72	36
Vermont Gold Coin	21	477	6	456	21	20	45
Morgan White	20	392	2	363	..	29	2
John Bull	6	387	22	338	48	48	24
Quick Crop	22	369	12	316	48	59	24
Hammond's Wonderful	10	333	57	319	26	14	31
Clark's Pride	9	322	40	274	16	48	24
Nott's Peachblow	22	303	36	264	..	39	36
Peck's Early	22	303	36	264	..	39	36
Rough Coat Cup	60	229	54	159	43	70	11
Early Carter	60	227	29	196	1	31	28
Vick's No. 9	8	217	48	181	30	36	18
Daybreak	4	217	48	181	30	36	18
James' Nugget	42	186	41	79	31	107	10
Todd's Seedling	20	65	21	43	34	21	47

TWELVE BEST YIELDING VARIETIES OF POTATOES—AVERAGE OF FOUR TO NINE YEARS.

Name of Variety.	Average Yield per Acre.		Name of Variety.	Average Yield per Acre.	
	Bush.	Lbs.		Bush.	Lbs.
1. Late Puritan, 9 yrs	436	32	7. Carman No. 1, 9 yrs	398	4
2. Holborn Abundance, 9 yrs	408	10	8. Burnaby Seedling, 8 yrs	394	44
3. American Wonder, 9 yrs	401	28	9. Country Gentleman, 5 years	392	2
4. Uncle Sam, 4 yrs	401	8	10. Rose No. 9, 7 years	390	39
5. Dreer's Standard, 9 yrs	398	50	11. Money Maker, 9 yrs	386	36
6. Penn Manor, 5 yrs	398	38	12. State of Maine, 9 yrs	379	48

An average crop for the twelve varieties of 399 bush. 13 lbs. per acre.

The above table was taken from bulletin No. 44, prepared by Dr. Wm. Saunders and Dr. C. E. Saunders.

EXPERIMENTS WITH CORN.

In the following table will be found the average results from testing varieties of sweet corn for the past five years. Although many varieties have been tested, those in the table have proven the most productive. The soil in which the corn was planted this year was a light sandy loam on which vegetables were grown in 1902. The soil

received a good dressing of rotted barnyard manure in the spring of 1903, and was then ploughed and thoroughly harrowed. The corn was planted on May 23 in hills three feet apart each way. About six kernels were planted in a hill. After germination had taken place and danger from cut-worms was over, the number of plants in a hill was reduced to four, twenty-four hills of each variety were planted, but twelve average hills of each were used for comparison. The corn was kept thoroughly cultivated during the summer.

Name of Variety	Fit for use, 1903.	Average date fit for use, 1899-1903.	Height, 1903.		Length of ears, 1903.	Average length of ears, 1899-1903.	Marketable ears from 12 hills, 1903.	Average number of marketable ears from 12 hills, 1899-'03.
Early.			feet.	in.	Inches.	Inches.		
Early Fordhook	Aug. 19	Aug. 17	5		5	$6\frac{1}{5}$	57	60
Extra Early Cory	" 22	" 18	5	7	6	$6\frac{4}{5}$	48	57
Burbank's Early Maine	" 22	" 19	5	4	7	7	41	57
Lackey's Early Sweet	" 27	" 19	5		6	$6\frac{3}{5}$	48	56
Ford's Early	" 28	" 19	5	10	$6\frac{1}{2}$	7	62	56
Early Marblehead	" 19	" 17	5	6	$6\frac{1}{2}$	$6\frac{4}{5}$	34	47
Second Early.								
Crosby's Extra Early	Sept. 5	Aug. 29	7	2	7	$6\frac{3}{5}$	38	58
Metropolitan	" 8	....	6	8	7	$7\frac{1}{5}$	56	51
Early Giant Sweet	" 5	Aug. 30	6	7	7	$7\frac{3}{10}$	47	50
Kendall's Early Giant	Aug. 31	" 28	5	2	6	$6\frac{9}{10}$	37	49
Child's Honey Dew	Sept. 5	" 31	7	1	7	$7\frac{2}{5}$	45	48
Shaker's Early	" 10	Sept. 2	7	4	7	$7\frac{9}{10}$	35	45
Medium.								
Black Mexican	Sept. 15	Sept. 6	6	10	7	$7\frac{1}{5}$	75	68
Stabler's Early	" 12	" 6	7		7	$7\frac{1}{2}$	53	52
Perry's Hybrid	" 10	....	7	2	$7\frac{1}{2}$	$7\frac{4}{5}$	44	47
Moore's Early Concord	" 12	Sept. 5	6	7	$7\frac{1}{2}$	$7\frac{3}{5}$	44	47
Early Evergreen	" 12	....	7	2	$7\frac{1}{2}$	$7\frac{1}{5}$	52	43
Late.								
Zig-Zag Evergreen (1899-1902)	....	Sept. 10	....		....	$7\frac{1}{4}$	....	49
Country Gentleman	Sept. 20	" 14	7		6	$6\frac{7}{10}$	36	47
Columbus Market	" 20	" 13	8	6	8	9	46	42
Shoe Peg (Ne Plus Ultra)	" 20	" 14	7	3	6	$6\frac{4}{5}$	39	40
Mammoth Sweet	" 17	" 14	7	6	$7\frac{1}{2}$	8	52	40
Stowell's Evergreen	" 20	....	7	5	$7\frac{1}{2}$	$7\frac{3}{5}$	25	34

TOMATOES.

This was an unfavourable season for tomatoes, and the yields in consequence were not large. The spring frosts destroyed many plants in this neighbourhood, and the wet, cool weather of most of the summer prevented much fruit from ripening on those plants which did escape the frost. At the Experimental Farm the plants were not set until after the frosts were over. If it had not been for the warm weather in September and October the yields would have been very much less than they were. A season like the past one brings out the value of the varieties of tomatoes which ripen their fruit early. The reader's attention is directed to the table in which is given the six varieties which ripened the most fruit previous to August 15. These are taken from a collection of 90 varieties tested this year. In this table it will be found that the Sparks Earliana yielded at the rate of 1,701 lbs. 9 oz. per acre before August 15. Between the

Early Ruby and the Sparks Earliana there is a difference in favour of the latter variety of 510 lbs. 8 oz. per acre. Tomatoes were selling in Ottawa on August 15, 1903, at 80 to 90 cents a pail, and before this date at higher prices. Taking the price at 80 cents a pail, and 20 lbs. of tomatoes to the pail, we have a difference in favour of Sparks Earliana of $20.42 per acre, and this in comparison with Early Ruby, which is also a very early variety, but not as smooth as Sparks Earliana. The Comrade did even better than the Sparks Earliana, but this is unusual, while the Sparks Earliana has always been very early and is recommended as the best early variety yet tested.

The seed of the tomatoes grown this year was sown in hot beds on March 24; the young plants were pricked out into strawberry boxes on April 17, and planted in the open ground on June 3, four by four feet apart each way, five plants of each variety being set. The soil was a light sandy loam which had been well manured for corn the previous year. The soil was kept cultivated until the growth of the vines prevented it.

TOMATOES—TWELVE BEST YIELDING VARIETIES, 1903.

Name of Variety.	Date of First Ripe Fruit, 1903.	Yield of Ripe Fruit to Aug. 15, 1903—five plants.		Total Yield of Ripe Fruit per acre to Aug. 15, 1903.		Total Yield of Ripe Fruit, five plants, all pickings 1903.		Total Yield of Ripe Fruit per plant, 1903.		Remarks.
		Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	
Atlantic Prize..........	Aug. 1.	1	4	680	10	114	4	22	14	Medium size, wrinkled to almost smooth, scarlet.
Canada Victor..........	July 21.	1	8	816	12	91	..	18	3	Medium size, wrinkled, scarlet.
Dominion Day....	Aug. 29.	..	..	..	..	90	8	18	2	" " "
Early Bermuda.	" 29.	..	..	..	..	81	4	16	4	" " "
Extra Early Advance ...	July 16.	1	7	782	11	78	3	15	10	Below medium size, smooth, scarlet.
Nolt's Earliest.........	" 16.	1	7	782	11	74	6	14	14	Medium size, wrinkled, scarlet.
Early Bird	" 17.	2	3	1,191	1	73	11	14	12	Below medium size, smooth, purplish pink.
Thorburn's Earliest	" 21.	1	8	816	12	71	..	14	3	Medium size, wrinkled, scarlet.
Bright and Early	Sep. 1.	..	..	..	..	68	..	13	10	Below medium size, smooth, scarlet.
Maule's Earliest	Aug. 1.	1	..	544	8	67	12	13	9	Medium size, wrinkled, scarlet.
Quicksure...............	July 20.	2	6	1,293	3	66	14	13	6	Medium size, wrinkled to almost smooth, scarlet.
Extra Early Red........	" 16.	2	3	1,191	1	64	11	12	15	Below medium size, smooth, scarlet.

TOMATOES—SIX EARLIEST VARIETIES, 1903.

Comrade	July 16.	3	12	2,041	14	32	8	6	8	Medium to below medium size, smooth, scarlet.
Sparks' Earliana (C.E.F.)	" 16.	3	2	1,701	9	52	3	10	7	Medium size, half wrinkled to smooth, scarlet.
Burpee's Climax........	" 18.	3	..	1,633	8	46	4	9	4	Medium size, smooth, purplish pink.
Sparks' Earliana........	" 20.	2	12	1,497	6	49	12	9	15	Medium size, half wrinkled to smooth, scarlet.
Frogmore Selected	" 16.	2	6	1,293	3	38	2	7	10	Below medium size, almost smooth, scarlet.
Quicksure	" 20.	2	6	1,293	3	66	14	13	6	Medium size, wrinkled to almost smooth, scarlet.
Early Ruby.	" 17.	2	3	1,191	1	46	4	9	4	Medium size, half wrinkled to smooth, scarlet.

SIX BEST YIELDING WRINKLED VARIETIES—AVERAGE FOR FIVE YEARS OR MORE.

Variety.	Number of Years.	Average Date of First Ripe Fruit.	Average Yield per plant. Lbs.	oz.	Remarks.
Dominion Day	5	Aug. 7.	17	12	Medium size, wrinkled, scarlet.
Early Bermuda	8	" 9.	16	14	" " "
Canada Victor	8	" 4.	16	6	" " "
Maule's Earliest	5	" 4.	16	1	" " "
Money Maker	8	" 3.	14	14	" " "
Conqueror	8	" 1.	14	3	" " to smooth, scarlet.

TWELVE BEST YIELDING SMOOTH VARIETIES—AVERAGE FOR FIVE YEARS OR MORE.

Bright and Early	7	Aug. 12.	16	9	Below medium size, smooth, scarlet.
Bond's Early Minnesota.	8	July 31.	15	6	" " purplish pink.
Early Bird	5	Aug. 2.	15	5	" " "
Atlantic Prize	8	" 4.	15	3	Medium size, smooth to almost smooth, scarlet.
Extra Early Advance	8	" 3.	15	2	Below medium size, smooth, scarlet.
Early Ruby	8	July 29.	14	7	Medium size, half wrinkled to smooth, scarlet.
Freedom	6	Aug. 3.	14	1	Medium to below medium size, smooth, scarlet.
Extra Early Red	5	" 1.	13	12	Below medium size, smooth, scarlet.
Burpee's Climax	5	" 8.	13	1	Medium size, smooth, purplish pink.
Comrade	8	" 4.	13	..	Medium to below medium size, smooth, scarlet.
Brinton's Best	8	" 12.	12	14	Medium to large, smooth, scarlet.
Autocrat	8	" 16.	12	14	Medium to above medium size, smooth, purplish pink.

PEASE—EXPERIMENTS FOR COMPARISON OF YIELDS AND QUALITY.

During the past six years more than 160 so-called varieties of pease have been tested in the horticultural division. Some of these have been found to be synonyms, and a large number of them have proven inferior to a few of the best varieties. Notes are taken on the time of maturing, productiveness, quality, and length of vine of the different varieties, and four years ago some of the best kinds were selected for test in large plots. This test was continued this year. Twelve hundred selected peas of 23 varieties were sown in drills 100 feet long and 2½ feet apart on May 6. Notwithstanding the extreme drought, the pease germinated well and there was a good stand. As each variety became ready for use, the date was recorded and the yields of green pods from the several pickings entered. Owing to the wet weather during July, the length of vines this year is greater than usual. In the following table the average results for the four years 1900-1903 are given.

PEASE—TEST OF VARIETIES.

Name of Variety.	Ready for use, 1903.	Average Date, ready for use, 1900-1903.	Number of pickings, 1903.	Green Pods, 100 feet, 1903.	Average Yield of Green Pods, 100 feet, 1900-1903.	Average length of vine, 1903.	Quality.
				Quarts.	Quarts.	in.	
Early—							
Exonian	July 3	July 5	3	24	34¾	24	Good.
American Wonder	" 5	" 6	3	28	32¾	31	Very good.
Child's Morning Star	" 2	" 3	3	24	32	41	"
Gregory's Surprise	" 2	" 2	4	30	31¼	40	"
Nott's Excelsior	" 5	" 6	3	26	28½	24	"
Thos. Laxton	" 5	....	3	32	....	40	Good
Second Early—							
Excelsior (2 years)	" 8	July 8	3	44	48	23	Very good.
Nott's New Perfection	" 13	" 11	3	52	45¼	54	"
Chelsea	" 6	" 7	2	40	41¾	30	"
English Wonder	" 8	" 10	4	36	40¼	30	Good.
Gradus	" 5	" 7	3	28	39½	39	Very good.
Premium Gem	" 8	" 8	3	40	37½	41	"
Medium—							
Burpee's Quantity	" 13	" 14	2	40	48¾	43	Good.
McLean's Little Gem	" 13	" 14	3	40	48	24	Very good.
McLean's Advancer	" 13	" 14	3	40	46½	46	"
Medium Late—							
Boston Wrinkled	" 18	" 19	3	66	61¾	66	Good.
Telephone (2 years)	" 18	" 18	2	32	59	81	Very good.
Heroine (3 years)	" 20	" 20	2	44	43⅓	48	"
Market Master	" 18	....	3	48	....	40	Good.
Late—							
McLean's Prolific	" 18	July 21	2	42⅔	61	42	Good.
Champion of England	" 20	" 21	3	46	59¾	74	Very good.
Juno	" 20	" 22	3	48	40	40	Good.
Stratagem	" 20	" 21	2	45⅓	38⅓	40	Very good.

EXPERIMENTS IN GROWING VEGETABLES IN A CHEESECLOTH INCLOSURE.

During the last three or four years a number of experiments have been tried in the United States in shading different kinds of crops. One of the most practical experiments, and one which gave the most satisfactory results from a monetary standpoint for a time was that conducted at the Connecticut Experiment Station, in shading Sumatra tobacco with cheesecloth, the extra cost in growing being much more than offset by the improved quality of the tobacco and the prices obtained for it. So much was this experiment appreciated that in 1902 there were a large number of acres of tobacco grown under shade in Connecticut.

No experiments had been conducted in Canada as far as the writer is aware in shading crops with cheesecloth until 1902, when an interesting test was made with vegetables by Dr. Graham Bell, at his Canadian home at Baddeck, Cape Breton, N.S. In these experiments it was found that the temperature was higher inside the inclosure, that lettuce and beans were tenderer, and that tomatoes ripened earlier, although the crop was not as large as outside.

At the Central Eperimental Farm two small inclosures were made this year. In one which was 24 x 17 feet in area, different kinds of vegetables were grown, and in the other, which was 62 x 14 feet, the Sumatra, Pennsylvania Seed Leaf, and Connecticut Seed Leaf varieties of tobacco were tested. These inclosures were completely covered on top and sides, and ends, with cheesecloth. Owing to the very cool, wet summer, which was unfavourable to a test of this kind, especially with tobacco, the

results in most respects were by no means conclusive. The experiment with tobacco may be dismissed with the mere statement that the plants grew better inside the inclosure and the leaves were nearly all perfect, while outside they were broken by the wind and injured by the soil. The texture of the leaf was lighter inside than outside.

In the other inclosure a number of kinds of vegetables were tested, the same varieties being grown just outside for comparison. As was already stated, the season was too wet and cool to get conclusive results, but the following notes are interesting and may be suggestive:—

All the vegetables inside grew better at first than those outside, and some continued to grow better until the end of the season.

Beets, sown June 10:—The tops were about as good inside as outside, but when they were pulled it was found that the crops of roots outside weighed 22½ lbs., while that inside was only 9 lbs.

Lettuce, sown June 10:—The plants grew almost equally as well inside as outside the inclosure. Outside they were from two to four days earlier than inside.

Radish, sown June 10:—Radish was ready for use inside fully three days before those outside. The radishes inside were perfectly free from maggots, while those outside were practically worthless. Those inside grew to be a large size before losing their crispness.

Beans, sown June 10:—The beans were ready for use three days earlier inside than outside, and the plants were about as vigorous. There were 11 quarts of green beans inside, as against 14 quarts outside.

Egg Plants, Water Melons, and Musk Melons, planted June 10:—These were all failures as regards crop, both inside and outside, owing to the wet and cool summer, but all plants grew well in both places. Hand pollination would be necessary to insure a crop even in a favourable season, as few or no insects could get into the inclosure.

Cauliflower, planted June 10:—The root maggot attacked those outside badly, while those inside, though injured some in the cold frame before transplanting, were not affected inside the inclosure.

Cucumbers, planted June 10:—Although the plants grew well, no cucumbers set inside until autumn, at which time a few rents in the cloth permitted insects to enter. There was only a small crop outside owing to the unfavourable season.

Tomatoes, planted June 10.—The plants grew well inside, but were never as robust as those outside. The first tomotoes ripened inside on July 15, and outside on July 21, six days later. The crop of ripe fruit was 55 lbs. 2 ounces outside, and only 15 lbs. 8 ounces inside, but there was twice as much ripe fruit before the middle of August inside as out.

Corn, planted June 10.—This grew more rapidly inside than out at first, but later on was not as robust.

The rain came through the inclosure as a mist, and hence the soil was not compacted the way it was outside. Light frosts which injured vegetables outside did not injure those inside.

While the vegetables were growing, daily records, with the exception of Sundays, were kept of the temperature inside and outside the inclosure. From June 12 until July 1, the readings were made at 7 a.m. and 1 p.m., and after that date until October 26, the temperature was taken at 4 p.m. as well. The temperatures taken at 7 a.m. in June and July are not considered in the average, as the position of the thermometer in the inclosure was found afterwards to favour it somewhat at that reading. The thermometer was changed on August 1. The average temperatures during the summer months up to September 1 were:—

		Number of Readings.
Outside, 7 a.m.	58·4	26
Inside, 7 a.m.	58·3	26
Outside, 1 p.m.	72·8	68

		Number of Readings.
Inside, 1 p.m.	76·23	68
Outside, 4 p.m.	74·7	52
Inside, 4 p.m.	76·9	52

The average temperature for September and October was:—

Outside, 7 a.m.	47·85	45
Inside, 7 a.m.	47·3	45
Outside, 1 p.m.	64·25	45
Inside, 1 p.m.	66·65	45
Outside, 4 p.m.	63·	44
Inside, 4 p.m.	64·7	44

As will be seen from the above the temperatures averaged a little higher inside than out. The greatest difference was 9 degrees.

Following is the description and cost of the inclosure for tobacco. The inclosure for vegetables was partly made of rough material, trees grown on the farm being used for posts, hence a fair estimate cannot be given of the cost, but the tobacco inclosure was all made of bought material.

The inclosure was 62 feet long by 16 feet wide, by 6 feet 6 inches high. These measurements being used to suit the width of the cheesecloth, the strips of which were 40 inches wide. Scantlings 2 by 4 inches were sunk 18 inches in the ground and about 8 feet apart, and when set were 6 feet 6 inches above the ground. Scantlings 2 by 4 inches were then nailed along the tops of these and across at every upright scantling for an upper framework, while along the base 6-inch boards were nailed for the same purpose. Braces of 2 by 4-inch scantling were used at the corner posts inside to strengthen the framework. A doorway was left in one corner. The cheesecloth was fastened to the frame by laths through which nails were driven. A wire was stretched across the top of the inclosure to prevent the cheesecloth from flapping and tearing.

Although there were several very severe wind storms and heavy rain storms during the summer, during wfhich many trees were blown down, this inclosure stood well.

Cost of making cheesecloth inclosure 62 feet long by 16 feet wide, by 6 feet 6 inches high.

To 333⅓ feet 2 by 4 scantling at $15 thousand	$5 00
75 feet lumber at $20 thousand	1 50
150 laths at $2.50 thousand	37½
169 yards cheesecloth at 5 cents per yard	8 45
Stitching 169 yards cheesecloth at 1½ cents	2 53½
5 lbs. nails at 3 cents	15
10 lbs. wire at 5 cents	50
Labour in making inclosure, 41 hours at 13½ cents	5 47
Total	$23 98
Estimated value of materials on hand	15 99
Total expenses for 1903	7 99

It will be seen that the inclosure was quite expensive, but as the framework will probably last for five years or more, the yearly expense is lessened considerably. The cheesecloth used in the vegetable inclosure cost 4½ cents a yard, but was somewhat torn by the end of the season, and it is doubtful if it will be of much value next year. The other was stronger and was in good condition in the autumn, and will probably last through another season.

The cheesecloth inclosure may be of value in cities and towns where it is difficult to have a garden owing to the injury done by cats, dogs, and even by young children. Vegetables will probably be tenderer as a rule grown inside an inclosure, though this was not the case this season owing to the wet weather. It may be useful to market gardeners for growing vegetables which are affected by root maggots.

FOREST BELTS

The trees in the forest belts are doing well on the whole and are becoming a prominent feature here. Annual measurements are taken of the season's growth, in height and diameter, of average trees of the most important species, and useful information is thus being obtained. Tables showing the growth have been published in the report from time to time, the last one being published in 1901. The trees in the plantation of European White Birch nearly all died this year and were removed. This birch evidently is not going to be long lived here, especially in the forest belts, where it is crowded. Some additional close planting was done in the belts this autumn where other trees had died, and vacancies were filled in the younger plantations of close planted trees and shrubs. These close planted trees and shrubs, which are set 2½ by 2½ feet apart, are not cultivated after the second year, as the trees and shrubs which are used for undergrowth shade the ground and prevent the growth of weeds to a large extent. One of the best schrubs tested for undergrowth is the Nine-bark (*Neillia opulifolia*) which grows well even in sod, and as it has heavy foliage, it shades the ground well.

ARBORETUM AND BOTANIC GARDEN.

The fine collection of trees, shrubs, and herbaceous perennials which has been brought together in the Arboretum and Botanic garden is increasing in attractiveness year by year and is being more used for reference by teachers and students in their work. Practically all the specimens are now neatly labelled with zinc labels and the trees and shrubs are labelled in duplicate, in order that they may be readily identified if one label should be destroyed. This year 654 trees and shrubs comprising 534 species and varieties were added to the collection, making the total number of specimens alive 4,942 up to the autumn of 1903, comprising about 3,000 species and varieties. There were also added 155 species and varieties to the Herbaceous Perennials, making the total number of species and varieties 1,700 living in the autumn of 1903.

Notes were taken during the year on the hardiness, growth and time of blooming of the trees and shrubs, and the time of blooming, length of blooming season, descriptions of the flowers, growth and height of plants of the herbaceous perennials.

During the past six years useful lists of plants have been published in the annual reports. In 1897 descriptive lists were published of *One Hundred of the Most Ornamental Hardy Trees and Shrubs,* and also of *One Hundred of the Best Herbaceous Perennials.* In 1898 an *Additional List of Good Perennials* was given. In 1899 a list was published of *Some Good Low Growing Flowering Shrubs,* and also *an Additional list of Good Perennials.* In 1900 there was given a *List of the Best Hardy Woody and Annual Climbers.* In 1901, *A List of the Best Lilacs,* and in 1902, *A List of Best Spring Flowering Perennials.* In 1899 there was also published a *Catalogue of the Trees and shrubs* which had been tested up to that date, with notes regarding their hardiness.

These lists have been of great service to Canadians, helping them to choose the best plants.

No list has yet been published of hardy trees and shrubs which have especially attractive foliage, bark and fruit, and as it is important to know which are best in this respect a list is herewith given of some of the most attractive of those tested in the Arboretum.

DECIDUOUS TREES, SHRUBS AND CLIMBERS WITH ATTRACTIVE FOLIAGE, BARK OR FRUIT.

Acer (Maple).—It is scarcely necessary to tell Canadians of the beauty of the autumn colouring of our maples, but although we see this beauty as we wander through the woods or along the streets one often fails to plant these fine trees near the home. During the latter part of summer odd trees of the Red Maple *(Acer rubrum)* stand out among their duller surroundings clothed in scarlet and crimson, and a little later on this tree fairly makes the woods on fire with its bright coloured foliage. Still a little later, the leaves of the Hard Maple *(Acer saccharinum)* take on their varied and attractive shades of red, green and yellow, and although the colours are not as bright as on the Red Maple they are often richer. The Silver Maple *(Acer dasycarpum)* is also very attractive, the green, yellow and bronze shades predominating. The most attractive maple not native to Canada is the Ginnalian Maple *(Acer tataricum Ginnala)*. This little tree is ablaze with colour every year, no matter what the season is like, and rivals the Red Maple for brightness; scarlet, yellow, and cirmson, being the predominating colours. In the spring the Schwedler's Maple *(Acer platanoides Schwedleri)* is a very attractive tree, the young leaves being of a dark purplish crimson and contrasting well with the surrounding foliage of other trees. This tree soon loses its spring colouring, however, and the leaves become dull green. Reitenbach's Maple *(Acer platanoides, Reitenbachi)* another purple-leaved variety, while not as attractive in spring as Schwedler's Maple, retains its colour better throughout the summer.

Berberis (Barberry).—The barberries are very useful for autumn effect, as their foliage and fruit are both attractive. Among the best of these are: Thunberg's Barberry *(Berberis, Thunbergii)*, which grows about four feet high. It is a compact shrub with bright green foliage in summer which changes to deep red in autumn. The scarlet fruit is very abundant and makes this barberry quite ornamental throughout the winter. Another species *(Berberis sinensis)* is also very attractive both in foliage and fruit, and the Common Barberry *(Berberis vulgaris)* is also good. The purple-leaved variety of the latter species is one of the best purple-leaved shrubs and is very attractive. The Oregon Grape or Holly-leaved Barberry is a very desirable low-growing shrub with thick glossy, holly-like foliage, which becomes bronzy purple in the autumn.

Betula (Birch).—The yellow foliage of most of the Birches contrasts strongly with other trees in autumn, but the most attractive of all is the Cut-leaved Birch *(Betula alba laciniata pendula)*, the finely cut leaves and graceful form of which make it one of the most attractive trees. There is a purple-leaved variety of the White Birch, but the purple is rather dull and the tree not especially desirable.

Caragana arborescens (Siberian Pea Tree). This shrub has many points of merit and its bright, green compound leaves and fruiting pods give it a place in such a list as this.

Catalpa.—The Catalpas have such large foliage, suggestive of a sub-tropic climate, that it renders them especially attractive in the colder parts of the country, where they give a warmer tone to the landscape. The Japanese Catalpa *(Catalpa Kaempferi)* is the hardiest species, but the Hardy Catalpa *(Catalpa cordifolia,* Jaune) though not as hardy, is more attractive and more desirable for the warmer parts of Ontario.

Celastrus (Shrubby Bitter-sweet).—There are two species of Shrubby Bitter-sweet, which are especially desirable for their attractive fruit. The first is the native Climbing Bitter-sweet *(Celastrus scandens)*. This is a very satisfactory hardy climber. The leaves are bright green and free from insects, and in the autumn and throughout the winter the scarlet and orange berries, which are produced in great abundance, make the vine very attractive. The outside of the berries is orange, but when they are cracked open by frost the scarlet inside is shown. The Japanese species *(Celastrus articulatus)* is just as attractive as the native one, and perhaps more so. The berries are smaller, but more abundant, and there is a greater contrast between the outside and inside, the outside being yellow and the inside orange. These vines may be kept quite shrub-like by cutting them back.

Cornus (Dogwood).—The hardy Dogwoods are most attractive in winter when the colour of the bark is much intensified. The best variety is *Cornus alba sibirica,* the bark of which is bright red in winter and in striking contrast with the snow, and other surrounding objects. There is a yellow barked variety of *Cornus stolonifera,* which could be used with good effect in contrast with the red-barked varieties. In foliage the most attractive hardy kind is *Cornus alba sibirica elegantissima* of the nursery catalogues, the leaves of which are delicately variegated with white, silver and green making this one of the best of variegated shrubs.

Cotoneaster.—There are several hardy ornamental species of Cotoneasters. The species with the most attractive foliage is *C. acutifolia,* the dark, glossy green leaves of which make this shrub quite attractive. Among red fruited species, *C. nummularia, C. tomentosa, and C. integerrima (vulgaris)* are the most desirable.

Crataegus (Hawthorn).—Some of the Hawthorns are attractive in flower, leaf and fruit; among these, two of the best are: *Crataegus coccinea* and *C. Crusgalli.* Both of these species have glossy foliage and bright red fruit, but the latter is, perhaps, preferable, as it does not sucker like the former, which may become troublesome.

Elæagnus (Olive).—The Russian Olive (*(Elœagnus angustifolia)* is one of the best trees with silvery foliage, and is a very handsome species. The Wolf Willow *(E. argentea)* has a finer silvery foliage than the last, but as this species suckers badly it should be planted with caution.

Euonymus (Spindle Tree).—The different species of Euonymus do not, as a rule, make graceful or attractive shrubs at any time except autumn. At that season of the year, however, they are quite noticeable on account of their scarlet and red fruit, which is in some species very bright. The most attractive in fruit are *Euonymus europaeus,* and *E. americanus,* but for brilliant coloured foliage *E. atropurpureus* and *E. alatus* are excellent, and the fruit of these is also attractive.

Fagus (Beech).—The purple-leaved Beech *(Fagus sylvatica purpurea)* is one of the handsomest of trees where it is hardy, but unfortunately it kills back to the snow line at Ottawa. The foliage is rich, bronzy purple and very attractive.

Hippophae rhamnoides (Sea Buckthorn).—This is a hardy shrub with fairly attractive narrow leaves, which bears an abundant crop of small bright orange fruit. It suckers badly and should be planted with discretion.

Ilex (Holly).—None of the hollies are satisfactory at Ottawa, with the exception of the Black Alder *(Ilex verticillata).* This shrub is not attractive during the summer, but in the autumn the scarlet holly-like fruit is very showy. There is a yellow fruited variety of this which is also good.

Lonicera (Honeysuckle).—Many of the Honeysuckles are attractive, both in flower and fruit, but the best showy species when in fruit is *Lonicera tatarica,* and the many varieties of it. The fruit of this species varies in colour from yellow to bright red and shows up well in contrast with the foliage. Of the hardy climbing species the most attractive in foliage and fruit are those with glacous foliage, such as *L. glauca, L. Sullivantii,* and *L. flava.*

Lycium (Matrimony Vine).—The Matrimony Vine is very useful for training over rocks, stumps and other places. The foliage is not especially attractive, but the numerous bright scarlet berries in autumn are very showy.

Neillia (Ninebark).—The ordinary Ninebark *(Neillia opulifolia)* is not a very attractive shrub, although the seed pods are rather showy, but the golden leaved variety, *Neillia opulifolia aurea,* is a very striking object, and where a strong-growing, golden-leaved shrub is desired it is one of the best.

Pachysandra terminalis.—This is a dwarf, hardy shrub with attractive evergreen foliage, and succeeds well in shady places.

Populus (Poplar).—The poplars have nearly all more or less attractive foliage, but probably the most attractive is the silver or white poplar, *Populus alba,* the leaves of which are silvery above and white below. The poplar multiplies rapidly by means of suckers, and as the falling seeds are disagreeable only trees with male flowers should

be planted. A pyramidal variety, *Populus alba pyramidalis*, is a striking tree. The golden-leaved poplar, *Populus deltoidea aurea* (Van Geerti), is a good golden-leaved variety, but is much subject to galls. A weeping variety, *Populus grandidentata pendula*, is a very graceful tree with good foliage, and is especially handsome in flower.

Prunus (Plum).—The native plums of Canada and the United States are very attractive in flower, and fruit and if varieties are chosen which have particularly attractive fruit, they may be used very advantageously.

Petelea trifoliata aurea (Golden Leafed Wafer Ash).—This is one of the finest hardy golden-leaved shrubs. There is a richness of colour in this variety which is not excelled.

Pyrus (Mountain Ash).—The mountain ashes are attractive both in flower and fruit, but are especially noticeable in autumn and winter when the bright coloured fruit hangs thickly on the trees. The European Mountain Ash or Rowan Tree, *Pyrus Aucuparia*, is perhaps the best, although the American Mountain Ash, *Pyrus americana*, is good.

Pyrus (Crab Apple, Apple).—The crab apples and apples make very showy trees, both in flower and fruit. One of the most useful crab apples is the wild Siberian crab, *Pyrus baccata*. As this does not grow large it can be planted where other trees would be too large.

Quercus (Oak).—The oaks keep up the show of colour in the autumn after most of the other trees have lost their leaves. The two most desirable hardy species are the Red Oak, *Quercus rubra*, and the black oak, *Quercus velutina*, both of these species colour up well in autumn and the leaves remain bright until severe frosts. The Scarlet Oak, *Quercus coccinea*, though not quite as hardy, colours well also.

Rhus (Sumach).—Sumachs are among the most showy autumn tinted shrubs and trees, and are very effective when grown wild in large masses. The common native species, the Staghorn Sumach, *Rhus typhina*, is one of the best and its compound leaves tinted with red are very striking. The Smooth Sumach, *Rhus glabra*, and the graceful cut-leaved variety of it are also fine. The foliage of the low growing fragrant sumach, *Rhus aromatica*, always colours well and there is a richness of tints in it not found in the others. The Smoke Tree, *Rhus Cotinus*, is a very striking shrub. The pedicels in the loose flowering panicles become covered with soft hairs which give a smoke-like effect to the whole plant. The leaves also colour well and are attractive both in summer and autumn.

Ribes alpinum (Mountain Currant).—This is quite a showy species with bright red fruit and deep green glossy leaves.

Rosa (rose).—The wild roses are nearly all effective when in bloom, and some have attractive foliage and fruit. One of the best wild roses in foliage and fruit is *Rosa lucida*. This species has glossy leaves which contrast well with the red fruit. The Japanese Rose, *Rosa rugosa*, has very ornamental foliage and fruit, the leaves being rich green and glossy and the fruit of large size and very striking. Another good species is *Rosa pomifera*, which has exceptionally large fruit and silvery or glaucous leaves. The Purple-leaved Rose, *Rosa ferruginea (rubrifolia)*, is one of the best purple-leaved shrubs. The leaves are deep reddish purple, and when the shrub is in bloom the contrast between the leaves and delicate pink flowers is very good.

Salix (Willow).—There are quite a number of willows which have ornamental leaves and bark and in the winter those with attractive bark are especially noticeable, and brighten up the landscape very much. The Laurel-leaved Willow, *Salix pentandra* (laurifolia), is a very ornamental tree, the leaves being deep green and very glossy. The rosemary-leaved willow, *Salix rosmarinifolia*, has narrow, rosemary-like leaves, and where a shrubby willow is desired it is one of the best. The best willows with attractive bark are: *Salix alba britzensis*, with red bark, and *S. alba vitellina flava* or *S. Voronesh* with yellow bark. These varieties are in striking contrast and stand out well in a winter landscape.

Sambucus (Elder).—Some of the elders are quite desirable. One of the best golden-leaved shrubs is *Sambucus nigra foliis aureis,* and although this kills back at Ottawa, it makes such rapid growth that it soon makes a show again. The Scarlet-berried Elder, *Sambucus racemosa,* and its variety *pubescens* may be used with good effect.

Spiræa.—There are a few hardy spiræas with good foliage, among these being *Spiræa Van Houttei,* also one of the best when in bloom ; *Spiræa arguta,* also one of the best when in bloom ; *Spiræa Thunbergii,* not quite hardy at Ottawa, and *Spiræa sorbifolia.*

Symphoricarpus (Snowberry).—The Snowberry, *Symphoricarpus racemosus,* is well known, the pure white berries in autumn being a familiar sight in most parts of Canada. The Coral Berry, *Symphoricarpus orbiculatus* (vulgaris), which has red fruit, is also effective, especially when in contrast with the other.

Tamarix amurensis.—This tamarisk is the hardiest of all those tested in the arboretum, and although it kills back some it makes strong growth during the summer. It is an elegant shrub with small foliage and tender branchlets.

Viburnum (Arrow-wood).—The viburnums are nearly all attractive shrubs in flower and foliage, and some species have very ornamental fruit. The Guelder Rose or High-bush Cranberry, *Viburnum Opulus,* is probably the most satisfactory. It is beautiful when in bloom, the foliage is effective, and the scarlet fruit which hangs on nearly or quite all winter makes it very desirable. Next will come the Wayfaring Tree, *Viburnum Lantana.* This also has ornamental flowers, foliage and fruit. Unlike the Guelder Rose, however, the fruit does not hang long. When ripening, the fruit is at first scarlet and becomes black when fully ripe. Two other species with very attractive foliage are: *Viburnum prunifolium* and *Viburnum dentatum,* both native species.

Vitis (Virginia Creeper).—The Virginia Creeper, *Vitis quinquefolia (Ampelopsis quinquefolia),* is well known, but must appear in a list of this kind. The leaves, while quite attractive in summer, become highly coloured at the first approach of autumn and for some time this vine is very effective. The self-fastening variety colours as well and has the advantage of clinging unaided to the wall on which it is trained.

REPORT OF THE CHEMIST

(Frank T. Shutt, M.A., F.I.C., F.S.C., F.R.S.C.)

Ottawa, December 1, 1903.

Dr. Wm. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith the seventeenth annual report of the Chemical Division of the Experimental Farms.

It will be found to include, I believe, much of interest and value to Canadian farmers—to those engaged in general or mixed farming, as well as to those devoting their attention to some special branch of agriculture, such as fruit growing, dairying, &c. The work of this Division is, necessarily, of a varied character and covers a wide field, but we may safely say that all investigations undertaken are directly prosecuted with a view of obtaining information that may be of immediate and practical benefit to one or other of the numerous divisions or departments of Canadian agriculture.

Before the brief enumeration which it is customary to make of the matter treated of in the report, it may be well to state that very much of the work that has engaged the attention of the staff of this Division during the past year will not here find a place. Thus, during three months of the past season, an investigation was carried on to ascertain the effect of certain factors or conditions of manufacture upon the composition of butter, and more especially upon its water content. In all, some 150 butters, made by an expert under known conditions of temperature, &c., have been carefully analysed. The results of this investigation are now tabulated and we trust they will furnish information of a useful character regarding the extent to which the composition of butter may be effected by the churning temperature, size of granules, temperature of wash water, &c. It is proposed to publish this work very shortly in bulletin form.

Further inquiry has been made in the matter of the effect of food on the quality of pork. In this, the fat of about 50 pigs on various rations has been analysed, but as the investigation is as yet unfinished, the results are, for the present, held over.

The following summary gives in outline the nature of the various investigations presented in this report:—

Chemistry of Horticulture.—The problem of *soil moisture conservation in orchards,* first investigated by this Division in 1901, has again received attention, and data have been obtained that emphasize the practical value of cultivation and the preservation of an earth mulch to retard surface evaporation. The great draft upon the soil's moisture by sod is also very clearly brought out by this season's experiments.

Continuing the inquiry as to the value of certain legumes as orchard 'cover' crops, the relative merits of the *Hairy Vetch,* the *Soja Bean* and the *Horse Bean* have been determined. Our data denote the extent to which the soil may be enriched and improved by these crops, and, further, afford evidence of a most satisfactory character regarding the Hairy Vetch—the latest among the legumes to be introduced for this purpose.

The composition of certain insecticides recently put upon the market has been ascertained. These include Kno-bug, Bug Finish, and 'Owens' Compound for the Protection of Trees.'

Fodders and Feeding Stuffs.—A considerable number of feeding stuffs, including various milling and other by-products, has been analysed and their relative nutritive value determined.

Interesting data as to the nutritive properties of the hull, kernel, and whole grain, respectively, of the oat are presented.

Molassine Meal and Improved Molasses Cattle Food are two feeding stuffs upon the Canadian market now reported upon. The latter is a product of the Dresden Sugar Co., Limited, Dresden, Ont., and is prepared from the exhausted pulp and molasses.

The principal field roots have again been examined and a table prepared showing the results that have been obtained in this research since 1900. The high feeding value of the 'Sugar' mangels has ag in been demonstrated.

Sugar Beets.—The sugar content of several of the principal varieties of factory beets, as determined from roots grown on the experimental farms at Ottawa, Nappan, Brandon, Indian Head, and Agassiz, has been ascertained. Results are also given of beets from the Knight Sugar Company at Raymond, South Alberta; of beets from the vicinity of Strathcona, Northern Alberta, and also of beets grown on the Provincial Farm, near Charlottetown, P.E.I.

Wheats.—A careful and thorough enquiry from the chemical standpoint has been made respecting the relative merits of the following wheats: Red Fife, Percy, Preston, Stanley, and Early Riga. The information obtained will prove especially interesting to those engaged in wheat growing in Manitoba and the North-west Territories. The results of this investigation will be found as a special report in the article on Wheat, in the current report of the Director of the Experimental Farms.

Swamp Muck.—A short article has been written on swamp muck, its nature and treatment. The use of muck as an absorbent in and about the farm buildings and the preparation of muck composts of various kinds have been concisely described, in order to furnish in printed form the information on these subjects so constantly requested.

Chemistry of Bee-keeping.—The experiments towards ascertaining the best conditions under which honey should be stored have been continued. The desirability of a warm, dry atmosphere for the storage of both comb and extracted honey is clearly brought out by this research.

We have, after a lapse of 13 years, again found adulterated beeswax. The presence of 25 per cent to 35 per cent of paraffin of a high melting point was noted in certain samples submitted to analysis this past summer. This adulterated wax had been purchased in the United States by a large 'bee supply' firm in Canada, and was immediately returned on the receipt of our report to the effect that the wax was not genuine.

Well waters.—The analyses of 55 samples of well waters from farm homesteads in various parts of the Dominion are given, and a brief report added as to the quality and wholesomeness of the waters.

Experiments in Chicken fattening.—Further results in the fattening of chickens have been obtained and are presented in the report of the poultry manager. The experiments included a further trial, in duplicate, of feeding in pens with yards attached as against feeding in crates, and also a trial in duplicate of feeding an 'all grain' ration as against a 'grain and meat' ration.

Correspondence.—The letters received by this division from November 30, 1902, to December 1, 1903, in addition to those referred to us by the other departments of the farm, numbered 1,234; those sent out, 1,163.

Samples received for analysis.—In the appended tabular scheme the samples received for examination during the past year have been enumerated and classified. The number exceeds that of the year previous by 101. Reference to the report of this Division will show the yearly increase in the number of samples forwarded to farmers, which may be taken as an excellent sign of the growing appreciation of the information to be obtained through chemistry on matters relating to practical farming. In order, however, to cope with these requests and at the same time carry on the special

(Photo. by F. T. Shutt.)

CHEMICAL LABORATORY, CENTRAL EXPERIMENTAL FARM, OTTAWA.

investigations which constitute the chief work of the Division, it is evident that very shortly further laboratory assistance will be necessary.

SAMPLES Received for Examination and Report, November 30, 1902, to December 1, 1903.

Samples.	British Columbia.	Northwest Territories.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.	Number still awaiting examination.
Soils	3	3	2	10	7	2	9	....	36	13
Mucks, muds and marls	....	3	....	4	4	3	8	8	30	7
Manures and fertilizers	....	....	....	4	1	3	10	5	23	1
Forage plants and fodders	2	....	5	13	9	4	3	....	36	16
Well waters	1	16	11	43	3	6	3	2	85	
Sugar beets	8	13	6	13	....	....	8	7	55	
Miscellaneous, including dairy products, fungicides and insecticides	4	9	4	365	37	6	6	3	434	15
Total	18	44	28	452	61	24	47	25	699	52

Acknowledgments.—Once again I would with much pleasure express my thanks to Mr. A. T. Charron, M.A., assistant chemist, and Mr. H. W. Charlton, B.A.Sc., second assistant chemist, for their valuable help and co-operation. The larger part of the analytical work of the various researches has necessarily been performed by them, and this work has, as I can bear testimony, been done skilfully and carefully.

I would gratefully acknowledge my indebtedness to Mr. J. F. Watson, who has continued to discharge faithfully and well his duties in connection with the clerical work of the division.

I have the honour to be, sir,

Your obedient servant,

FRANK T. SHUTT,
Chemist, Dominion Experimental Farms.

THE CONSERVATION OF MOISTURE IN ORCHARD SOILS.*

In further investigating the factors that affect the soil's moisture-content, we have this year obtained comparative data during the early months of the season, from plots in the Central Experimental Farm orchard (1) under cultivation during past and present season, (2) in sod during past and present season, and (3) in sod 1902, but ploughed early in the present season, according to the following plan:—

Plot A.—This plot was cultivated during the summer of 1902, as well as throughout the present season. The cultivations during the period of examination this year were made on May 12 and June 1.

(*N.B.*—This is Plot I of the second series, 1902, the moisture-content of which is recorded in the report of the Chemical Division for that year, page 138-9.)

* The results of our previous work upon this question, with reference particularly to the relation of tillage, sod and cover crops to soil moisture-content, are to be found in the Report of the Chemical Division, Experimental Farms, 1901 and 1902.

Plot B.—This plot adjoins A and was under sod, 3 years old, throughout the season.

(*N.B.*—This is Plot 2 of the second series, 1902.)

Plot C adjoins B. In sod 1902. Sod ploughed under April 13, 1903; disc harrowed May 29, and cultivated June 3.

The very severe and exceptional drought that prevailed in the Ottawa district during the spring and early summer months of this year, afforded an excellent opportunity for prosecuting our research in this matter of the conservation of soil moisture. That the rainfall for the spring months of 1903 was very much below the average will be seen from the following summary :

TOTAL PRECIPITATION IN INCHES.

—	1898.	1899.	1900.	1901.	1902.	1903.
March	3·20	4·96	6·15	4·04	3·62	1·96
April	4·90	1·65	5·55	2·36	2·92	1·15
May	2·90	2·62	3·04	4·97	1·62	0·24
June 1st to 5th	....	0·24	1·81	0·96	0.99	none.
Total	11·00	9·47	16·55	12·33	9·15	3·35

The soil samples upon which the moisture determinations were made were taken as in previous years, to a depth of 14 inches and consequently the percentages and amounts of water given in the following table are those present in the soils to that depth.

CONSERVATION OF SOIL MOISTURE.

Date of Collection.	Plot A. Cultivated 1902 and 1903.			Plot B. In Sod 1902 and 1903.			Plot C. In Sod 1902; Cultivated 1903.		
	Per cent.	Pounds per acre.		Per cent.	Pounds per acre.		Per cent.	Pounds per acre.	
1903.		Tons.	Lbs.		Tons.	Lbs.		Tons.	Lbs.
May 14th	12·03	261	1,218	5·32	107	982	11·85	257	337
" 23rd	12·65	277	89	4·78	96	66	6·51	133	431
June 5th	7·76	160	1,880	3·03	59	1,552	8·91	187	247

Discussion of Results.—We cannot fail at first sight to be struck with the marked character of these data, which, as might have been expected from the abnormal dryness of the season, emphasize the value of cultivation and the earth mulch for the retention of the soil's moisture. They certainly present a lesson of the greatest significance and importance to orchardists.

It should be borne in mind that the plots adjoin one another; that the soil throughout the series is of a uniform character (a light sandy loam); and that the moisture-content after the autumn rain of the previous season, as determined in November, 1902, when the winter set in, was practically identical for them all.

May 14.—Analysis shows that at this date the amount of moisture in the soil of Plot A (12·03 per cent) was less than it was in the previous November by about 3 per cent. Much of this loss undoubtedly might have been prevented by earlier cultivation, the first harrowing and formation of the earth mulch being only two days before the

collection of the sample for analysis, viz., May 12. Nevertheless, the soil was quite damp, both to the touch and in appearance. So far as one could judge it appeared to be amply supplied with moisture for the requirements of the orchard trees.

Plot B, which by that date was covered with a heavy growth of grass, green and luxuriant, contained less than one-half of the moisture in A, viz., 5·32 per cent. This means that somewhat more than 150 tons per acre, to a depth of 14 inches, had been lost from B by remaining in sod, lost by the growth of the grass and the capillary action that had been set up by allowing the soil to remain unstirred. The earth of this plot was already assuming a powdery condition.

Plot C.—The sod had been turned under one month previous to the date of collection, viz., April 13. Its moisture content was somewhat less than that of Plot A, but the difference is comparatively insignificant. The results of this plot give satisfactory evidence of the importance of turning under the previous cover crop at an early date in districts likely to be visited by a spring or early summer drought. By this means it is seen the moisture may in a very large measure be conserved.

May 23.—Between May 14 and 23 the rainfall was scarcely more than one-tenth of an inch (·12). This probably was not sufficient at any time to thoroughly dampen the surface of the soil, for the precipitation occurred on four days of the interval and on no one of them exceeded more than a few hundredths of an inch. Practically speaking, it evaporated as soon as it fell, without benefiting the soil.

Plot A.—Now, in spite of this adverse condition, this soil, by reason of its mulch, was able to hold its own ; indeed, its moisture at this date was some half a per cent higher than it was nine days earlier. No doubt there had been loss by evaporation from the soil, but the loss had been more than compensated for by water brought up from the subsoil by capillary action.

Plot B.—On the other hand, this plot continued to lose, and now showed 11½ tons less moisture per acre than at the date of the preceding collection.

Plot C.—The soil of this plot had dried out very considerably, losing almost half its water. This was undoubtedly due to the fact that the turned over sod was not immediately disc-harrowed and an earth mulch formed. The drying atmosphere and winds freely permeated the heavy sod, abstracting its moisture. This points to the necessity of immediately discing and cultivating after the ploughing under a heavy sod, in order that capillary action may bring up water from below, and that a mulch may be formed that will prevent or retard its loss through evaporation. This plot was not disc-harrowed until May 29.

June 5.—Between May 23 and June 5 a period of thirteen days, but three-one-hundredths of an inch (·03) of rain fell. During the latter six days of this period there was absolutely no precipitation. Under this condition we find the moisture-content of plots A and B considerably reduced.

Plot A.—This soil now held but 7·76 per cent water. Probably if it had been cultivated again in this period (the previous cultivation had been on May 12) it would have had a higher water content. As it was, the drying out process had affected the soil for more than a foot. It still contained, however, over 160 tons to a depth of 14 inches.

Plot B.—The examination of this soil at this date showed it to be in the condition of powder. It had no adhesiveness and had the appearance of a soil thoroughly dried by exposure to air. Its percentage of moisture had been reduced to 3·03, having lost 48 tons per acre since the date of the first collection three weeks previous. The grass was still alive, but showing very little vitality and no growth. The leaves of the orchard trees growing in the sod had begun to shrivel and fall. It was evident that unless rain came very shortly these trees would succumb. It is important to note that under these extreme climatic conditions the soil of Plot A possessed 100 tons more water per acre in the surface 14 inches than that of Plot B, a very considerable amount.

Plot C at this date contained 8·9 per cent water, an increase of practically 2·5 per cent over that it possessed on May 23. This, in my opinion, was owing to the disc

harrowing it received on May 29, followed by cultivation. By these means not only was surface evaporation largely arrested, but capillary action was set up which enabled the surface soil to draw upon the water content of its underlying soil.

The drought this year has taught a very important lesson in orchard soil management. It has emphasized what we gave experimental data for in 1902, viz., the very exhaustive character of sod as regards soil moisture. It has furnished proof of the immense value of cultivation in arresting the drying out of soils, and lastly the necessity not only of early ploughing under the cover crop in districts where drought is likely to prevail, but also the desirability of further working the soil by disc harrow and cultivator in order to again set up capillary action with the underlying soil, as well as to create an earth mulch to prevent surface evaporation.

ORCHARD COVER CROPS.

HAIRY VETCH, SOJA BEAN, AND HORSE BEAN.

Without entering into any lengthy discussion as to the various functions of a cover crop and the many chemical and physical benefits it may confer upon an orchard soil, it may suffice for the present purpose to remind our readers briefly of one or two of the more important advantages of such crops in increasing the fertility of the soil.

Apart, then, from the benefit to be derived from the conservation of moisture in the summer, and the winter protection of the roots of the trees, it is sought by this system of orchard treatment to enrich the soil, by the addition of vegetable matter and nitrogen, by the conversion of mineral plant food of the soil into more available forms and by the retention and storing up of the more soluble nitrates produced in the soil during the summer months. Many crops are used or have been suggested for these purposes, but it is only the legumes which possess the ability (through the agency of certain bacteria residing in nodules on their roots) to add nitrogen to the soil—nitrogen taken from that inexhaustible store, the atmosphere. Hence, it is that the legumes are *par excellence* the most valuable of all cover crops.

The value of the clovers—red and mammoth—and of alfalfa, in this connection, has already been demonstrated in several of our reports and bulletins—the first account of which, in the reports of the Chemical Division, is to be found in that for 1896. Our experiments in that year showed that in three months, from the middle of July to the middle of October, large crops could be obtained from alfalfa and the clovers, even when grown on a poor, sandy soil. Further, that these legumes contained in their foliage and roots in the neighbourhood of 100 lbs. of nitrogen per acre, nitrogen which we believe for the most part was obtained from the atmosphere. For the purposes of comparison with the results of the present season from Hairy Vetch, Soja Bean, and Horse Bean, we may insert in tabular form the data respecting these clovers and alfalfa:—

ANALYSIS of Clovers and Alfalfa, 1896.

Sown, July 13th. Collected, October 20th.	Composition.			Nitrogen.	Weight of Crop Per Acre.		Amount of certain Constituents Per Acre.		
	Water	Organic Matter.	Ash.		Tons.	Lbs.	Organic Matter.	Ash.	Nitrogen.
Mammoth Red, stems and leaves..	79·13	17·05	3·82	0·620	6	1,310	2,269	508	82
" roots....... ...	77·57	19·41	3·02	0·662	3	1,260	1,409	219	48
Total..........	......	....	.. .	....	10	570	3,678	727	130
Common Red, stems and leaves....	76·24	18·84	4·92	0·718	4	1,779	1,842	481	70
" roots..............	71·22	25·61	3·17	0·784	2	1,445	1,394	172	47
Total...........	......	....	......	....	7	1,224	3,236	653	117
Crimson Clover, stems and leaves..	83·32	13·91	2·77	0·382	11	234	2,093	602	85
" roots.............	83·87	12·92	3·21	0·304	3	201	801	199	19
Total..................	......	....	.....	....	14	435	2,894	801	104
Alfalfa, stems and leaves	71·63	23·81	4·56	0·671	5	1,192	2,664	510	75
" roots....................	64·74	29·47	5·79	0·557	5	558	3,120	613	61
Total..................	......	....	......	....	10	1,750	5,784	1,123	136

EXPERIMENTS WITH COVER CROPS, 1903.

In the experiments conducted during the past season by the Horticulturist with cover crops, the following modification was tested. Instead of sowing broadcast, (as has been the custom) the crops under trial—Hairy Vetch, Soja Beans and Horse Beans—were planted in rows 27 inches apart and the spaces between the rows kept cultivated. This was done, as explained at length by the Horticulturist in his report, to serve a dual purpose—the conservation of soil moisture by means of a dry earth mulch, and the production of a crop that might serve as a winter protection to the roots (by holding the snow) and for the enrichment of the soil.

The seed was sown on light, sandy soil in the farm orchard, June 18, and the samples collected for estimation of crop per acre and analysis, on September 21. At this latter date the Hairy Vetch formed a perfect mat or carpet 6 to 8 inches in thickness, entirely covering the ground, but it had not flowered. The Soja Beans were practically 2 feet high, and well branched and possessing many pods. The Horse Beans stood 3½ feet high, having made a vigorous growth, and were well podded.

After the date of collection the weather contined open and mild for several weeks, and no doubt if a further examination had been made in the middle of October larger amounts per acre than those recorded would have been obtained.

The roots in each instance were taken to a depth of 9 inches.

ANALYSIS of Hairy Vetch, Soja Bean and Horse Bean used as Cover Crops, 1903.

Sown June 18. Collected September 21.	Height or length on date of collection.		Composition.			Nitrogen.	Weight of Crop Per Acre.		Amount of certain Constituents per Acre.		
			Water	Organic Matter.	Ash.				Organic Matter.	Ash.	Nitrogen.
	ft.	in.				%	Tons.	Lbs.	Lbs.	Lbs.	Lbs.
Hairy Vetch (Vicia villosa) stems and leaves	3	3	82·78	15·44	1·78	·54	11	1895	3689	425	129
" " " roots			86·35	12·35	1·30	·41	2	345	536	56	18
Total							14	240	4225	481	147
Soja Bean (Soja Hispida) stems and leaves	1	10	74·69	23·13	2·18	·57	7	350	3319	313	82
" " " roots			80·12	18·92	·96	·48	1	900	549	28	13
Total							8	1250	3868	341	95
Horse Bean (Faba vulgaris, var. equina) stems and leaves	3	6	84·04	14·89	1·07	·43	7	733	2193	156	63
" " " roots			86·72	12·47	·81	·30	2	852	605	39	15
Total							9	1585	2798	195	78

Hairy Vetch.—This plant gave the heaviest crop of the three under trial. It also furnished the largest amount of nitrogen. Considering the entire plant, we have, from three months' growth, in round numbers 2⅓ tons (4,225 lbs.) of humus-forming material per acre, containing almost 150 lbs. of nitrogen. In these data we have a strong endorsation of the very high opinion expressed by certain horticultural writers regarding the fertilizing value of this plant.

Soja Bean.—Though not yielding as heavily as the foregoing, it is undoubtedly a useful orchard cover crop, since when sown in drills it allows of surface cultivation for the conservation of moisture. Moreover, it should prove a good snow-holder, by reason of its upright form of growth and stiff stems. Somewhat more than 1¾ tons (3,868 lbs.) of humus-forming material per acre were obtained, containing almost 100 lbs. of nitrogen.

Horse Bean.—Although at the time of collection this crop made the finest appearance of the three, the analytical data place it last in fertilizing value. In total weight of crop the figures show 9¾ tons, approximately, per acre, but owing chiefly to its high percentage of water it contained less organic matter and nitrogen than the Soja Beans. The difference in favour of the latter was approximately 1,000 lbs. of organic matter and 20 lbs. of nitrogen, per acre. There is this, however, to be said in favour of the Horse Bean, that its root system is more extensive than that of the Soja Bean and the plant, being more succulent, would probably decay more quickly the ensuing season. In humus-forming material the figures denote nearly 1½ tons (2,798 lbs.) per acre.

FODDERS AND FEEDING STUFFS.

BANNER OATS.

An important consideration in determining the relative feeding values of different varieties of oats lies in the proportion (by weight) of hull to kernel, for the nutritive properties of the former are very small compared with those of the latter.

This subject has already been discussed by Dr. Wm. Saunders, the Director of the Experimental Farms. It, therefore, only remains to say that it is proposed, as time allows, to obtain chemical data both as to kernels and hulls, respecting all the more commonly grown oats in Canada, and that a beginning has been made in this inquiry by an examination of that widely known and highly esteemed variety—the Banner. This has included not only a determination of the relative weight of hull and kernel, but also their complete analysis, together with that of the whole grain. These oats were of the crop of 1902, grown on the Central Experimental Farm.

Proportion of Kernels to Hulls.

Kernels	71·92
Hulls	28·08
	100·00

ANALYSIS of Banner Oats: Whole grain, Kernels and Hulls.

—	Moisture.	Albuminoids.	Fat.	Carbohydrates.	Fibre.	Ash.
Oats, (whole grain)	12·74	11·22	4·82	58·84	9·47	2·91
Kernels	12·03	14·51	6 24	63·15	1·93	2·14
Hulls	10·19	2·60	0·78	49·63	31·63	5·17

The tremendous difference in feeding value between the kernel and the hull is very well brought out by the foregoing data. In albuminoids, or flesh-formers, and in fat or oil—the two most valuable constituents of a feed—*the hull is seen to contain but very small percentages compared with the kernel.* Further, the hull is practically one-third indigestible fibre, which in the kernel does not amount to two per cent. In fact, oat hulls would appear to have a considerably lower feeding value than oat straw.

It has been shown by Dr. Wm. Saunders that considering any one variety of oats, samples differing in weight do so by reason of the relative plumpness and heaviness of the kernel, and not to any extent from variations in the weight of hull. It is, therefore, of moment not only to know the proportion of hull to kernel in the varieties upon the market, but also to purchase the heaviest oats of the variety selected—for this will mean the heavier kernel.

BRANS AND SHORTS.

These two by-products in the manufacture of flour are by far the most important of all concentrated feeds used in the Dominion to-day. They are produced from Canadian wheats in Canadian mills in large quantities. From their extensive use, from their high nutritive value, as well as from the fact that they are materials rich in nitrogen and ash constituents derived from Canadian soils—and which under careful management are capable of being returned, in a large measure, to the soil—they are materials well worthy of the consideration of our farmers and dairymen.

Bran.—As a milk-producer, bran possesses merits peculiarly its own; it has long been recognized as standing in the very front rank for this purpose; indeed, in the opinion of many experienced dairymen it has no equal among meals and milling products for keeping up the milk flow.

This, undoubtedly, is due, in part, to its composition, furnishing, as it does, in large amounts and in excellent proportions those constituents required in the elaboration of milk; in part, to its high digestibility by the cow, which is furthered by its loose, light, bulky nature, permitting the digestive fluids to readily and easily act upon it and the other foods with which it may be used. It, moreover, has a certain mild mechanical action upon the digestive tract, and particularly in the intestines, that serves to keep the animal from becoming constipated.

Bran consists of the three outer coats of the wheat kernel, together with the aleurone layer immediately underlying them. These outer coats are very fibrous and contain large percentages of phosphates and other mineral constituents; the aleurone layer consists of cells exceedingly rich in protein. Fat also is present in fair amounts, so that all the necessary materials for the production of milk are present. In the internal economy of the animal, a large proportion of these nutrients is digested and, as has been demonstrated by many carefully conducted experiments, subsequently through the blood is transformed into muscle and bone and milk. Its 'nutritive ratio,' that is, the proportion of digestible protein to the digestible fat and carbo-hydrates, is 1 : 3·68, which clearly demonstrates the value of this by-product for furnishing the protein necessary to supplement that in the home-grown coarse fodders (usually characterized by a low protein-content) in order to obtain a balanced ration.

The composition of the bran will vary somewhat according to the character of the wheat (spring or winter) and of the milling, and of the relative freedom of the bran from weed seeds and other foreign matter. Spring wheat seems to yield a bran containing slightly more protein than winter wheat.

Shorts and Middlings.—According to Snyder,* 'wheat shorts consist of those outer portions of the wheat kernel which contain less fibre, protein and ash than the parts which make up the bran. This product is practically the fine bran subjected to more complete pulverisation and mixed with some low grade flour. It is more variable in composition than bran, but for some purposes, as pig feeding, is more valuable. When the wheat germ is added to the shorts the product is called middlings or shorts middlings.' Henry, in his work 'Feeds and Feeding,' says: 'Shorts consist of re-ground bran. Middlings contain the finer bran particles and more flour; often with this grade there are incorporated the germs of the wheat grain,' and further, he states, 'Middlings and shorts are terms used interchangeably to some extent. It has become rather common of late to find shorts consisting simply of ground-over bran, almost free from floury particles.' It is evident from these statements that the distinction between bran and shorts, which has been so marked in past times, is now becoming obliterated, and this is borne out to some extent by the appearance and analytical data of the Canadian samples we have examined this year, and which will shortly be discussed.

The introduction of the 'roller' process of milling and the wonderful improvement in bolting and sifting machinery now permits the miller to include practically all beneath the aleurone layer as flour—a most desirable result from his point of view. The germ is usually mixed with the lower grade flours. This means, naturally, that shorts or middlings as we have known them from the old stone mill will soon become a feed of the past. From the farmer's standpoint, and particularly that of the pig feeder, this is perhaps to be regretted, for as food for pigs shorts have always been most highly esteemed, especially in conjunction with skim milk. As an offset to this loss of mealy shorts, we have to recognize that the shorts of the future will be richer in protein and mineral matter, and consequently of greater value for muscle making and the development of the frame. It does not seem likely, however, that it will prove as desirable a feed for pigs and young stock generally.

Before presenting the results obtained recently on Canadian brans and shorts it will be of interest, for the sake of comparison, to insert the average composition of

* The Chemistry of Plant and Animal Life (Snyder), p. 306.

these feeds as obtained by American chemists. The following averages are taken from tables in Henry's 'Feeds and Feeding':—

Feed.	No. of Samples.	Water.	Ash.	Protein.	Fibre.	Carbo-hydrates.	Fat.
Bran, spring wheat	10	11·5	5·4	16·1	8·0	54·5	4·5
" winter wheat	7	12·3	5·9	16·0	8·1	53·7	4·0
Middlings	32	12·1	3·3	15·6	4·6	60·4	4·0
Shorts	12	11·8	4·6	14·9	7·4	56·8	4·5

We may also insert certain data from Bulletin No. 160 of the New Jersey Experiment Station (1902), which gives the results from the analyses of 91 samples of wheat bran, 49 of which were reported as of winter wheat, 34 of spring wheat, and 8 either mixed or not designated. The composition of 20 samples of middlings are also included:—

—	Protein.	Fat.	Fibre.
Bran, Winter	15·96	4·63	7·51
" Spring	16·97	5·27	8·81
Middlings	15·21	3·85	2·34

The figures from this latter table bear out the contention that spring wheat bran contains more protein than that of winter wheat, though the results from Henry lend little support to that view. Middlings, it will be seen, are slightly lower in protein, fat, fibre and ash constituents than bran, by both sets of results.

Canadian Brans.

To obtain information regarding the composition and relative feeding value of Canadian brans and shorts, we have submitted to analysis a series of samples of these feeds, kindly supplied by certain of the leading milling companies of the Dominion. The results obtained from this investigation may now be considered.

Eight brans have been analysed, the samples in every case being received direct from the mills. In appearance they were clean and bright, the flakes thin and large, and with one or two exceptions particularly free from all mealiness. Several contained a few hulls and occasionally whole grains of wheat or oats, and in three cases a few weed seeds were noticed. They were all free from sweepings and dirt and would undoubtedly be considered of first class quality. The exact character of the wheat from which these brans were prepared could not in the majority of cases be learnt, but we may presume that spring wheat only was used in the Manitoban and Keewatin mills, and also that a large proportion of the wheat of the Ontario mills was of that nature.

Moisture.—This constituent is seen to vary from 9·73 per cent to 12·37 per cent—the average from all the samples being 11·07 per cent, a figure somewhat lower than the American average, and pointing, other things being equal, to the higher feeding value of our brans.

It will be observed that in the majority of instances the drier brans are from mills in Manitoba. Only two of the series contain more than 12 per cent water, and these are from Ontario mills. The drier atmosphere of the North-west and the larger proportion of spring wheat used in milling there are, we suppose, the factors that have led to this low water-content.

Protein.—This nutrient, the most important of all, varies from 13·25 per cent to 15·31 per cent, the average being 14·52 per cent. Making a comparison with the average for protein in American brans, our figure is seen to be somewhat the lower. Whether this is due in part to differences in structure of the wheat, *e.g.,* greater thickness of the outer fibrous coats, or a thinner aleurone layer in Canadian spring wheat, or whether it is due to some recent improvement or alteration in the milling machinery affecting the proportion of the various products, we are at present unable to say, but this we hope at some future time to investigate.

Fat.—Certain differences apparently exist between the various samples as regards fat content, these differences for the most part, however, are not of any great magnitude. The general average for the fat is practically the mean of the figures quoted by Henry for American brans, though somewhat lower than the results from New Jersey.

Carbo-hydrates.—The nitrogen-free extract (chiefly starch) is seen to be very fairly uniform throughout the series and to give an average practically identical with that quoted from American sources.

Fibre.—Here we find a slight increase over the percentage given by American chemists. If on further work brans from Canadian spring wheats in general show this higher fibre content it will be of interest to ascertain the cause. If one or other of the theories already advanced when discussing the protein content be found correct, we shall at the same time receive an explanation for this increased percentage of fibre.

Ash.—The average percentage of ash obtained agrees very closely with that given for pure brans. An inspection of the data shows that all the samples were free from mill sweepings, dirt, sand, &c.

Analysis of Brans—1903.

Name of Milling Firm.	Address.	Moisture.	Protein.	Fat.	Carbo-hydrates	Fibre.	Ash.
		%	%	%	%	%	%
Ogilvie Flour Mills	Winnipeg, Man	9·73	14·00	4·55	55·18	10·74	5·80
Alexander & Law Co	Brandon, Man	10·57	15·19	5·19	53·83	9·80	5·42
Lake of the Woods	Portage la Prairie, Man	9·89	14·81	4·68	53·75	10·63	6·24
"	Keewatin, Ont	10·83	14·56	3·60	54·56	10·93	5·52
Goldie Milling Co	Galt, Ont	12·70	13·25	3·78	54·61	9·66	6·00
Tilsonburg Milling Co......	Tilsonburg, Ont	11·81	14·19	4·17	54·45	9·70	5·68
Kingston Milling Co......	Kingston, Ont......	10·65	15·31	4·87	52·96	10·35	5·86
Winchester Roller Mills....	Winchester, Ont......	12·37	14·84	4·12	54·20	9·28	5·19
	Average	11·07	14·52	4·37	54·19	10·14	5·71

Canadian Shorts.

The analytical results of nine samples of shorts are presented. In eight of the nine cases they were received from the mills forwarding the brans. They were all labelled 'shorts,' the term middlings not being used either in their description or designation.

Though the samples differed somewhat as regards fineness and, to some extent, as to mealiness, we may safely state that they all resembled fine bran rather than the floury, mealy shorts of the old stone mills.

Protein.—The percentage of protein is seen to be considerably higher than in the case of the brans. This we presume may be due to more of the aleurone layer and less of the outer fibrous coat entering into the composition than in the case of the brans. This increase in protein-content amounts to practically 1·5 per cent. With the exception of one sample, they are all over 15 per cent protein, ranging from 15·15 per cent to 17 per cent, the average being 15·93 per cent.

Fat.—In this constituent also the shorts give higher figures than the brans, the average for the former being 5·24 per cent and for the latter 4·37 per cent. In the comparatively high fat-content we have confirmatory evidence that these shorts are more closely related to bran than to the old stone mill shorts.

Carbo-hydrates.—Considering the average, there is about 5 per cent more carbohydrates (starch) in the shorts than in the bran. This points to a difference in their structural composition, and clearly indicates that we cannot conclude that the shorts are merely finely ground bran. This extra starch makes the shorts more mealy than the bran, and consequently better suited for certain classes of farm stock, as already pointed out in our general remarks on shorts and middlings.

Fibre and Ash.—In both of these constituents the shorts show much lower percentages than the brans. The fibre of the shorts is about one-half and the ash is approximately two-thirds, of that in the bran. Since it is the outer coats of the wheat kernel that have a high fibre-content and are particularly rich in ash, it is obvious that these shorts are not to be considered as entirely made up of finely ground bran.

ANALYSIS of Shorts, 1903.

Name of Milling Firm.	Address.	Moisture.	Protein.	Fat.	Carbohydrates	Fibre.	Ash.
		%	%	%	%	%	%
Ogilvie Flour Mills........	Winnipeg, Man........	8·88	15·62	4·83	59·07	7·51	4·09
Alexander & Law Co	Brandon, Man........	9·83	17·00	6·23	59·12	4·43	3·39
Lake of the Woods	Portage la Prairie, Man	9·54	16·03	5·97	59·15	5·41	3·90
"	Keewatin, Ont........	10·38	16·25	5·50	57·40	6·51	3·96
Goldie Milling Co	Galt, Ont.............	12·34	14·62	4·54	58·76	5·74	4·00
Tilsonburg Milling Co.	Tilsonburg, Ont.......	11·60	16·75	5·61	57·55	4·77	3·72
Kingston Milling Co....	Kingston, Ont........	10·81	16·41	5·38	60·07	3·82	3·51
Winchester Roller Mills....	Winchester, Ont.......	12·13	15·15	3·98	60·50	4·80	3·44
Woodstock Roller Mills....	Woodstock, N. B.	7·58	15·56	5·09	64·56	4·11	3·10
	Average........	10·34	15·93	5·24	59·58	5·23	3·68

Concluding this comparison of Canadian brans and shorts, we may state that the analytical data of this investigation clearly indicate the higher feeding value of the shorts. Their larger percentages of protein, of fat, and of carbo-hydrates and their lower fibre content, all point in the same direction, and furnish most conclusive and satisfactory proof of their superiority.

MOLASSINE MEAL.

This feeding stuff, imported from England, is prepared from crude molasses and peat or moss—the latter constituent acting simply as an absorbent and not adding in any way to the nutritive value of the compound, though counteracting, it is claimed, the tendency to 'looseness' frequently induced when molasses alone is fed.

As received at the farm, this 'meal' was in the form of a loosely held together mass, brownish black, with all the appearance of an agglutinated peat. It was somewhat moist and slightly sticky, but readily broken into granules on handling.

Its analysis furnished the following data:—

Moisture	11·74
Water soluble extract	59·88
Ash	8·92

In the water soluble extract:—

Cane sugar	45·37
Glucose	5·40
Nitrogenous organic matter	5·13
Ash (chiefly potash salts)	6·30

On comparing these results with those from an analysis made in England, we find a considerable difference in moisture-content, the present sample containing some 8 per cent less water, which necessarily means a higher value for the meal. This drying out may merely be accidental and due to the exposure of the sample to the drier air of this country. We presume it would not occur to such an extent when the feed is imported in bulk.

The constituent of importance in such compounds is sugar, which in the animal economy has a very high value as a source of energy and heat, and in the formation of fat. Its ready solubility, and the ease with which it is digested and assimilated, place sugar before all other carbo-hydrates, starch, gum, &c., for these purposes.

Molasses, and more particularly molasses feeds, of various kinds, have been used for some time in Europe in the feeding of horses, cattle and swine, and when judiciously employed and in conjunction with a sufficiency of nitrogenous matter, have given excellent results.* Apart from their direct food value, they are stated to act beneficially in increasing the appetite, stimulating the digestion, and keeping the animal in a thrifty condition.

Though containing a certain amount of nitrogenous material, molassine meal does not in itself possess a sufficiency of protein for the animal's requirements. Hence, it can only serve as a part of the ration, and is most economically employed as a substitute for say one-third to one-half of the usual grain feed.

The sample of molassine meal here reported upon was received from Messrs. Grassett & Reid, Toronto.

IMPROVED MOLASSES CATTLE FOOD.

This newly introduced feeding stuff is made by the Dresden Sugar Company, Limited, Dresden, Ont., and constitutes what may be termed a by-product in the manufacture of sugar from beets. It is prepared from two residues in the process—the exhausted beet pulp and waste molasses. These, by the aid of suitable machinery to accomplish the necessary pressing, drying and mixing are greatly concentrated and converted into a palatable fodder. As placed upon the market, it has the appearance of dry pulp, chips or flakes, quite loose and without any stickiness so noticeable in other feeding stuffs into which molasses has entered as a component. We have analysed several samples of this feed, together with a sample of the untreated dried beet pulp, and append our results. The particulars are as follows:—

No. 1.—Dried beet pulp (collected at the factory by Dr. Saunders).

No. 2.—Improved Molasses Cattle Food (collected at the factory by Dr. Saunders).

No. 3.—Improved Molasses Cattle Food, taken from a 75-lb. bag sent to the Experimental farm.

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* A short article on this subject, including an analysis of molasses, is given in the Report of the Chemical Division, Experimental Farms, 1898.

No. 4.—Improved Molasses Cattle Food, taken from one bag of 100 lbs. in a consignment of 4 tons sent to the Experimental farm for a feeding trial.

No. 5.—Taken after mixing 20 bags of above mentioned consignment.

ANALYSIS of Dried Pulp and Molasses Cattle Food from Dresden Sugar Company, Limited, Dresden, Ont.

—	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
	%	%	%	%	%
Moisture	7·61	4·59	4·31	3·99	4·36
Crude protein	7·62	8·75	8·37	8·03	8·28
Fat	·40	·16	·09	·10	·74
Carbo-hydrates	59·49	65·44	66·07	64·38	64·61
Fibre	20·85	14·42	15·52	18·73	16·36
Ash	4·03	6·64	5·64	4·77	5·65
	100·00	100·00	100 00	100·00	100·00
Aqueous extract, dried at 105° C	9·58	35 11	24·90	12·58	22·17
Ash in aqueous extract	1·02	3·80	2·55	1·31	1·97
Cane sugar	6·92	25·85	17·06	9·19	13·51
Glucose (reducing sugar)	0·88	1·11	3·78	0·63	2·05
Non-albuminoid nitrogenous substances	....	2·56	2·99	0·31	·84
Albuminoids	7·62	6·19	5·38	7·72	7·44

Dried Pulp.—This is the first product in the manufacture of the 'Improved Molasses Cattle Food.' It is stated that 100 lbs. of the freshly exhausted beet pulp yield approximately 5 lbs. of the 'Dried Pulp.' This agrees very well with our analysis of the fresh pulp made some years ago, which was as follows:—

Analysis of Fresh Pulp.

Water	95·72
Crude protein	·51
Carbohydrates	2·36
Fat	0·01
Fibre	1·26
Ash	·14
	100·00

Roughly speaking, therefore, we may say that the dried pulp has, weight for weight, 20 times the feeding value of that of the fresh pulp. Notwithstanding this great concentration, dried pulp, by reason of its low protein and fat and its high fibre is not in the same class as the various meals and concentrated feed stuffs. It is rather to be considered with those generally known as coarse fodders—from many of which it, however, differs in being much more digestible and palatable. We may safely assert from a consideration of its composition, its digestibility and palatability, that 'dried pulp' has a distinct feeding value and would constitute a wholesome addition to the ration when roots or ensilage are scarce.

Improved Molasses Cattle Food.—From the practical feeding standpoint this differs from 'Dried Pulp,' simply in containing more sugar, derived from the added molasses. This undoubtedly greatly enhances the feeding value, since sugar is readily

assimilable and performs most important functions in the body in the production of heat and the formation of fat.

From the four samples so far anlysed it would not seem that uniformity in composition has yet been obtained. This is most probably due to the fact that the process of manufacture is new and not as yet thoroughly worked out in all its details for the best results, that is, as far as obtaining uniformity of product is concerned. The differences referred to lie chiefly in the sugar-content ; in other words, in the proportion of molasses that had been dried with the pulp. This will clearly be seen by a reference to the table of data. The solid matter dissolved out of the feed by cold water (aqueous extract dried at 105° C) is seen to vary from 35·11 per cent to 12·58 per cent; containing from 25·85 per cent to 9·19 per cent cane sugar. The extracted matter in the dried pulp is fairly constant at about 9·5 per cent, containing nearly 7 per cent cane sugar. The differences here noted in the Improved Molasses Cattle Food must therefore be due to the varying amounts of molasses with which the pulp has been dried. This is further supported by the data for the ash in the extract and those for the non-albuminoid nitrogenous substances—the latter being practically absent in the dried pulp. We have dwelt upon these differences because, as stated in the preceding chapter, the sugar content is the real measure of the feeding, and we might add the fattening, value of these preparations. It has already been remarked that in addition to its function as a heat-producer, sugar is an excellent fattener. It would seem that provided the animal has a sufficiency of nitrogenous material for its requirements, the addition of sugar to the ration greatly enhances the latter's fattening properties.

The crude protein is slightly higher in the Improved Molasses Cattle Food than in the Dried Pulp, but by the further differentiation of this into the albuminoids or true flesh-formers and the non-albuminoid nitrogenous substances (nutrients of much lower feeding value) it will be seen that the percentage of the former is really greater in the Dried Pulp. The nitrogenous substances in molasses are practically all of the non-albuminoid nature, and consequently the addition of molasses to the pulp lessens the proportion of the true albuminoids present in the finished product.

The percentage of moisture in this food is exceedingly low—in fact, considerably lower than that of other feeding stuffs ordinarily upon the market. This, of course, means a larger percentage of dry matter. This dryness enhances its nutritive qualities and keeping properties besides facilitating convenience in using.

Its proportion of fibre—the nutrient of least value in a fodder—is somewhat lower than that of the Dried Pulp. This is occasioned by the addition of molasses, which contains no fibre. The larger the proportion of molasses contained in this food, the more sugar—which is the element of value—and the less fibre will it possess.

As the manurial value of a fodder is a matter of some moment, it should be pointed out that the mineral matter of molasses consists chiefly of potash—an important element of plant food. This will appear largely in the urine, and consequently sufficient litter should be used to absorb all the liquid manure if this potash is to be saved for crop use.

COTTON SEED MEAL.

We had occasion last year to call the attention of our readers to the fact that an inferior brand of this valuable feeding stuff had appeared on the Canadian market (see page 148, report of the Experimental Farms, 1902). From samples received during the past year, it is evident that this low grade meal is still being sold in the Maritime provinces and at prices very little below those of the genuine article. It may be distinguished by those accustomed to handling cotton seed meal, as darker in colour and coarser than good quality meal. Such a sample was received from Mr. H. H. Bartlett, St. Andrews, N.B., and stated to have been purchased in St. Andrews from an agent of the Florida Cotton Oil Company, Jacksonville, Fla. This, it will be remembered, is the firm from which the inferior brand analysed and reported upon last year was obtained:—

Analysis.

Moisture	10·11
Protein (albuminoids)	23·81
Fat	5·98

That this meal is very much inferior to genuine cotton seed meal will be obvious when it is stated that the latter contains in the neighbourhood of 42 per cent protein and 13 per cent fat.

Two samples were received from Mr. Thos. B. Smith, Truro, N.S., and also submitted to analysis. They were taken from the one consignment (2,000 lbs.), but differed from one another considerably in depth of colour. The meal was labelled: 'Canary' Brand Cotton Seed Meal, manufactured for R. W. Biggs & Co., Memphis, Tenn.

Analysis.

	No. 1 Light coloured.	No. 2 Dark coloured.
Moisture	6·71	6·74
Protein	43·06	39·43
Fat	11·47	8·10

No. 1 meal, though somewhat below the standard in fat, is evidently genuine, but such is not the case with No. 2. Though not as seriously adulterated as the Florida Cotton Oil Company's meal, this is seen to be decidedly inferior, both as to protein and fat, and consequently should not be sold at the same price as No. 1 meal.

The consumption of concentrated feed stuffs steadily increases year by year, and will continue to do so. Their price, in the majority of instances, is high compared with other fodders, and for this reason alone it is of paramount importance that there should be no falling off in their feeding value. Many of these feeds are by-products, and consequently variable in their composition or at least capable of being mixed with inferior materials. As instances, we may cite oat feeds, from oat meal manufacture; gluten feeds, from the starch factory; and cotton seed meal. Analyses of these in the Farm laboratories have frequently shown that the selling price does not agree with their nutritive value. Further, it is often difficult, or indeed impossible, for a farmer to judge of the value of such feeds by mere inspection; an analysis is absolutely necessary to learn their percentages of protein and fat, the two constituents of greatest importance from the feeding standpoint.

For these reasons, the writer is of the opinion that such by-products should be sold under a guarantee and that there should be an official examination and analysis of them, similar to that in vogue for fertilizers. If it is necessary to protect the farmer in connection with the purchase of plant food, it seems equally essential that there should be a like protection in the purchase of animal food. During the past few years many of the states of the American Union have passed laws compelling the manufacturer or vendor of such feeds to attach to every consignment a tag on which is printed the guaranteed analysis, showing the percentages of protein and fat the feed contains. It appears that the time is about at hand when we shall require that the same information and protection should be given to Canadian farmers.

THE RELATIVE VALUE OF ROOTS.

For several years past we have examined the principal field roots, with the object of ascertaining how far their nutritive value may vary from season to season, as well as to obtain data which would enable us to judge of their relative feeding properties.

The chief varieties of mangels analysed were: Gate Post, Giant Yellow Globe, Giant Sugar Feeding, Half Long Sugar Rosy, and Half Long Sugar White. Of carrots, the varieties were: Short White and Half Long White. Of sugar beets: Danish Improved. Of turnips: Skirvings. Of Swedes: Selected Purple Top.

ANALYSIS of Roots, C. E.F., Ottawa, 1903.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average weight of one root.	
	%	%	%	lbs.	ozs.
Mangel—Half-long Sugar Rosy (Sugar mangels)	87·55	12·45	9·61	2	8
Half-long Sugar White (Sugar mangels)	86·54	13·46	9·82	1	13
Giant Sugar Feeding (Sugar mangels)	85·26	14·74	10·40	2	8
Giant Yellow Globe	89·11	10·89	6·17	3	13
Gate Post	87·07	12·93	7·38	3	3
Carrots—Improved Short White	89·60	10·40	4·77	1	10
Half-long White	90·17	9·83	2·52	1	15
Turnips—Skirvings	89·03	10·97	2·78	2	9
Selected Purple Top	88·99	11·01	2·77	5	6

The results are, on the whole, very satisfactory, showing that notwithstanding the abnormal character of the season most of the varieties are very little behind their average in dry matter and sugar.

The so-called sugar mangels again maintain their superiority, the richest of them, as in 1902, being the 'Giant Sugar Feeding' mangel, but the varieties, 'Half Long Sugar Rosy' and 'Half Long Sugar White,' follow very closely. They are all evidently roots of a high feeding value.

The following results, as regards dry matter and sugar of the mangels 'Gate Post' and 'Giant Yellow Globe,' during the past four years, will prove interesting. They show that despite changes due to season, &c., the relative position of these two well known roots has been maintained throughout.

DRY Matter and Sugar in Mangels.

—	1900.		1901.		1902.		1903.	
	Dry Matter.	Sugar in Juice.	Dry Matter.	Sugar in Juice.	Dry Matter.	Sugar in Juice.	Dry Matter.	Sugar in Juice.
	%	%	%	%	%	%	%	%
Gate Post	11·14	6·15	9·41	4·15	13·90	9·39	12·93	7·38
Giant Yellow Globe	8·19	2·64	9·10	4·08	10·24	5·24	10·89	6·17

We have not the same continuous series of results for the carrots and turnips examined, and shall not, therefore. at the present time undertake any discussion of the feeding values of the different varieties.

SUGAR BEETS.

The principal varieties of sugar beets grown on the several Experimental Farms have, as in past years, been examined. The results will be found in the subjoined table; the particulars of growth are also presented in tabular form.

SUGAR BEETS grown on the Dominion Experimental Farms, 1903.

Variety.	Locality.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Coefficient of Purity.	Average weight of one Root. Lbs.	Oz.
Vilmorin's Improved	Nappan, N. S.	16·29	19·55	83·3	0	14
" "	Ottawa, Ont.	15·61	16·90	92·3	1	8
" "	Brandon, Man.	11·36	15·41	73·7	1	4
" "	Indian Head, N.W.T	15·52	18·27	84·9	1	3
" "	Agassiz, B. C.	17·47	21·08	82·8	1	15
Klein Wanzleben	Nappan, N. S.	14·23	18·80	75·7	1	1
" "	Ottawa, Ont.	15·12	17·38	86·9	1	9
" "	Indian Head, N.W.T	16·19	20·80	77·8	1	1
" "	Agassiz, B. C.	17·34	21·06	82·3	2	3
French "Very Rich"	Nappan, N. S.	15·46	19·00	81·3	0	15
" " "	Indian Head, N.W.T	16·90	20·60	82·0	0	15
" " "	Agassiz, B. C.	17·53	22·00	79·6	2	4
Danish Improved	Nappan, N. S.	11·65	15·58	74·7	1	1
" "	Ottawa, Ont.	13·49	15·74	85·7	1	6
" "	Indian Head, N.W.T	11·24	14·56	77·1	1	8
" "	Agassiz, B. C.	11·42	15·94	71·6	2	3
Red Top Sugar	Nappan, N. S.	12·37	16·80	73·6	1	2
" " "	Ottawa, Ont.	11·02	13·32	82·7	1	8
" " "	Indian Head, N.W.T	11·43	14·40	79·3	1	7
" " "	Agassiz, B. C.	8·14	13·67	59·5	3	12
Improved Imperial	Nappan, N. S.	10·47	17·69	59·1	1	1
" "	Ottawa, Ont.	12·19	14·33	85·0	1	12
" "	Indian Head, N.W.T	13·60	16·97	80·1	1	9
" "	Agassiz, B. C.	10·33	14·87	69·6	4	7
Danish Red Top	Nappan, N. S.	11·48	15·77	72·7	1	4
" " "	Ottawa, Ont.	11·63	14·12	82·3	1	9
" " "	Indian Head, N.W.T	11·49	15·35	74·8	1	9
" " "	Agassiz, B. C.	10·48	15·31	68·4	3	4
Royal Giant	Nappan, N. S.	9·43	14·40	65·4	1	12
" "	Ottawa, Ont.	11·03	12·95	85·1	1	8
" "	Agassiz, B. C.	11·04	15·91	69·3	3	3
Name unknown, seed from Mr. C. N. Bell	Indian Head, N.W.T	17·45	21·40	81·5	1	3

NOTE—It should be observed that of all the varieties here reported upon the Vilmorin's Improved Klein Wanzleben and the French "Very Rich" are those only commonly employed for sugar extraction.

SUGAR BEETS grown on the Experimental Farms, 1903—Particulars of Growth.

Locality.	Date. Sowing.	Date. Pulling.	Distance between Rows. Ft.	In.	Plants in Row. In.	Remarks
Experimental Farm—						
Nappan, N.S.	May 15.	Oct. 22.	2	0	12	Light clay loam; manured fall 1902.
Ottawa, Ont.	....	....	....		....	Moderately heavy loam in excellent condition.
Brandon, Man.	June 1.	Sep. 21.	3	0	9	Black vegetable loam; manured two years ago.
Indian Head, N.W.T.	May 26.	Oct. 9.	2	6	10	Clay loam; 15 loads of rotted manure to the acre.
Agassiz, B.C.	" 7.	" 22.	2	6	9	Sandy loam; clover stubble ploughed in fall of 1902.

Nova Scotia, Nappan.—The first four mentioned beets in the table—Vilmorin's Improved, Klein Wanzleben, French 'Very Rich' (Très Riche) and Danish Improved—

practically comprise the varieties now grown for factory purposes. Their suga content and purity this year do not differ widely on the whole from those reported f this locality in 1902, though certain individual variations are to be observed. Thu the average percentage of sugar, as calculated from the four varieties, is 14·44 for 19 and 14·41 for 1903.

Ontario, Ottawa.—The exceptional, and in many respects unfavourable, seas experienced here this year—a protracted drought in the spring and early months fo lowed by a somewhat excessive rainfall at the time when the beets were maturing a storing up sugar—has materially influenced both the sugar-content and the purity the beets. In nearly every instance, this season's results are lower than those of la year. Averaging the results from Vilmorin's Improved, Klein Wanzleben and Danis Improved, we obtain the following results:—

1902	—Percentage of sugar in juice	16·00
	Co-efficient of purity	91·0
1903	—Percentage of sugar in juice	14·74
	Co-efficient of purity	88·3

Manitoba, Brandon.—Only one variety was examined from this district—Vi morin's Improved. The results are exceedingly low for this excellent beet, indicatin that conditions were unfavourable for a root suitable for factory purposes.

North-west Territories, Indian Head.—The results from this farm show a decide improvement over those obtained last year. Thus, we find the average sugar conte in the four varieties first on the list was 13·97 per cent in 1902, whereas, this seaso it is 14·96 per cent. It is of interest to note that a variety, the seed of which was se by Mr. C. N. Bell, but the name of which is unknown, was found to contain 17·45 p cent of sugar.

British Columbia, Agassiz.—In spite of the fact that most of the roots were muc larger than is recommended for factory purposes, the varieties, Vilmorin's Improve Klein Wanzleben, French Very Rich, and Danish Improved, had a most satisfacto sugar content. The average of the three first mentioned is 17·45 per cent, and th average of the first four (including Danish Improved, the roots of which were alt gether too heavy) is 15·94 per cent.

Southern Alberta, Raymond.—A sample of Klein Wanzleben, forwarded by th Knight Sugar Company, who have established a factory at this place (in operation f the first time this autumn) gave the following results:—

Percentage of sugar in juice	20·40
Co-efficient of purity	80·79
Average weight of one root	1 lb. 3 oz.

As the sample is stated to be representative of a field of 30 acres, we must co clude that the crop will prove highly satisfactory for sugar extraction.

The following particulars have been forwarded by the Knight Sugar Compan 'Variety of beet, Klein Wanzleben, sown May 28, pulled October 31. Distance betwe rows, 20 inches; distance between plants in row, 10 inches. Clay loam. No manur no irrigation. Sod broken up in the autumn of 1901; disced and reploughed in autum of 1902, preparatory for spring planting. This field of 30 acres yields 12 tons per acr

Northern Alberta, Strathcona and vicinity.—In the following table are given t data from the examination of 5 samples received from the Secretary of the Board Trade, Strathcona:—

ANALYSIS OF SUGAR BEETS—Northern Alberta.

Number.	Locality.	Variety.	Marks.	Percentage of Sugar in Juice.	Percentage of Solids. in Juice.	Coefficient of Purity.	Average weight one Root.
							Lbs. Oz.
1	Strathcona	Danish Improved	J. F.	9·37	12·97	72·24	1 6
2	"	" "	W. F.	10·84	13·55	80·00	1 5
3	Robert Hill	" "	M. R.	6·75	10·72	62·96	2 10
4	"	" "	W. M.	9·73	13·56	71·75	1 6
5	Ellerslie	K. Wanzleben	J. G.	11·74	14·92	78·68	.. 13
6	Clover Bar	"	G. A. C.	14·37	19·91	72·17	.. 15
7	Rabbit Hill	Wanzleben and Danish Imp.	J. J. S.	14·37	19·97	72·00	1 3
8	Clearwater	K. Wanzleben	W. L.	14·38	19·65	72·23	1 1

Nos. 1-5.—These results are not indicative of good factory beets; indeed, they are much too low to allow of profitable sugar extraction. In one instance (No. 3) the roots were too large, but even allowing for this, it is evident that the unfavourable season, heavy rains and low temperatures prevailing in the late summer months when the beet matures, had a disastrous effect upon the sugar content. Last year (1902) 4 samples of Klein Wanzleben from the same locality were tested and gave data of a much more satisfactory character.

Nos. 6, 7 and 8.—These three samples are practically identical, the differences being insignificant. Though not exceeding in sugar content a moderate average, they are decidedly superior to samples Nos. 1 to 5, which had been received and tested some three weeks earlier.

SUGAR BEETS—Northern Alberta, Strathcona and Vicinity.

Number.	Name.	Locality.	Variety.	Dates.		Distance Between.		Remarks.
				Sowing.	Pulling.	Rows.	Plants.	
1	Jas. Fisher	Strathcona	Danish Imp.	June 6	Oct. 15	18	7	Soil rather poor.
2	Wm. Fitzpatrick	"	"	" 2	" 3	16	9	Black clay loam, fairly good.
3	M. Reynolds	Robert Hill	"	" 2	" 13	18	8	Heavy black loam, new land.
4	Wm. Magee	"	"	" 5	" 10	22	7	Heavy clay loam, lying low.
5	J. Govenlock	Ellerslie	K. Wanzleben.	May 28	" 10	16	9	Heavy black loam.
6	G. A. Coff	Clover Bar	"	June 4	" 14	......	......	Black loam.
7	J. J. Scribner	Rabbit Hill	Danish Imp.	" 6	" 20	......	......	
8	W. Loughridge	Clear Water	K. Wanzleben.	May 29	" 19	......	......	Rich black loam.

Wallaceburg Sugar Company, Limited, Wallaceburg, Ont.—A sample of beets (Klein Wanzleben) forwarded from the factory of the Wallaceburg Sugar Co., Limited, afforded the following data:—

Percentage of sugar in juice	15·61
Percentage of solids in juice	19·26
Co-efficient of purity	81·05
Average weight of one root	2 lbs. 5 oz.

As to richness in sugar and purity, these beets are of excellent quality, and this i spite of their weight being somewhat above that usually recognized as best for factor purposes.

Prince Edward Island, Charlottetown.—Two samples of sugar beets grown on th provincial farm near Charlottetown, were forwarded by Mr. E. J. McMillan, Secretar of Agriculture, Charlottetown, P. E. I., who writes, 'The yield was so small, owing t damage to the young plants by cut worms, as to be scarcely worth reporting. Thes roots were taken from a portion of the plot which escaped being cut down.'

Variety.	Sugar in Juice.	Solids in Juice.	Coefficient of Purity.	Average Weight of one Root.
1. Vilmorin's Improved	19·93	24·35	81·64	1 lb. 0 oz
2. Klein Wanzleben	12·07	17·33	69·64	1 " 2 "

As the roots of sample No. 1 were somewhat shrivelled, the sugar content, as her reported, is no doubt slightly higher than in the beet as pulled. The evidence, how ever, is sufficiently clear and conclusive of the high quality of these beets.

No. 2 is below the average and not sufficiently rich for factory use. If grow under similar conditions to No. 1, it seems doubtful if the seed were really of the Klei Wanzleben variety, which usually gives much higher results.

In forwarding the beets, Mr. E. J. McMillan, writes as follows : 'Both sample were grown side by side on a rich loam soil; the previous crop was grain. The lan was ploughed in the fall and again in the spring, when a dressing at the rate of thirt cart-loads per acre of barn-yard muck and well rotten manure was turned under. Th surface was well cultivated and the seed sown in rows, 26 inches apart, on May 2 The plans were thinned to about 8 inches apart in the rows. Cutworms completel destroyed a portion of the plots so that the rate of yield could not be determined. Th roots were pulled in the last week of October, and were found to be very rough. W hope to overcome this in another year by more careful cultivation.'

NATURALLY-OCCURRING FERTILIZERS AND WASTE PRODUCTS.

SWAMP MUCK: ITS NATURE AND TREATMENT.

Attention has been repeatedly directed in the past reports of this Division to th agricultural value of swamp muck, black muck, peat, bog mud and allied materials, ric in organic matter, and from a large correspondence we have reason to believe tha many farmers, more particularly in the older provinces, are now employing thes deposits and finding in them a useful source of humus and nitrogen. Requests fo information as to the nature and uses of these naturally-occurring fertilizers, howeve continue to be received, and a concise account of the several ways in which they ma be advantageously treated, seems to be in constant demand. We accordingly offer th following statements and suggestions in the hope that they may prove of benefit to ou readers.

Origin and Nature of Swamp Deposits.

The accumulation of the semi-decayed vegetable matter known as peat swamp muck, &c., is due to stagnant water. Swamps and bogs are the site of former lakes or ponds, or possibly mere depressions covered by water, which

have been filled up by the gradual encroachment of aquatic or semi-aquatic vegetaation from their shores. Successive generations of mosses, and other water-loving plants, starting in the shallows and drawing their food supply year after year from the remains of the previous season's growth, have gradually pushed out towards the middle of these bodies of water, until in many instances the lake or pond has entirely disappeared. Under such conditions, though there is a certain amount of decomposition, a large proportion of the humus conserved is especially rich in nitrogen. In this way, vast deposits have accumumlated, which may be utilized to furnish vegetable matter (humus) and nitrogen to both clays and sands deficient in these valuable constituents.

Uses and Treatment of Peat and Muck.

Speaking generally, the application of these materials in the crude and raw condition is not to be aavised, for their plant food does not exist in immediately available forms. Fermentation is necessary to set it free. Further, the mode of occurrence develops acid, and as acidity or sourness is more or less injurious to ordinary farm crops, it is desirable to correct this quality before the muck is applied to the soil. For these reasons, we counsel one or other of the following means of preparation:—

In the first place, after digging the muck—which may be done at any time when other work on the farm permits and the bog is sufficiently dry to be accessible to teams —it is well to pile it and allow it to so remain throughout the winter. The weathering —the action of the air and frost—serves to sweeten and disintegrate the muck, oxidizes any poisonous iron compounds that may be present, and thus prepares it for more ready decomposition in the compost heap. There are mucks so sweet and so well decomposed that they may with benefit be at once applied to the soil, but these are not of common occurrence.

Use as an Absorbent in and about the Farm Buildings.

The air-dried and roughly powdered muck—and especially that from the upper layers of the bog composed chiefly of sphagnum and other mosses—is an excellent absorbent. Its use as such in and about the farm buildings, or wherever there is liquid manure likely to go to waste, cannot be too strongly recommended, for thereby not only is valuable plant food conserved (the liquid portion of the manure being by far the richer in fertilizing constituents), but the subsequent fermentation of the muck now intimately mixed with the manurial elements, rapidly brings about the conversion of its plant food into an assimilable condition. All mucks are not equally suitable for this purpose, but those of a peaty, mossy or powdery nature will be generally found of good absorbent capacity, and can be so employed. No special directions are necessary in this matter, but we may state that the practice of spreading a shovelful of the air-dried muck (which may be kept in a heap convenient to the building) in the gutter behind each cow after cleansing the stable, has been found to work excellently. It soaks up the liquid manure and makes the cleaning of the stable an easy task. The resulting manure, now largely increased in bulk and value, may be taken at once to the fields, or, still better, perhaps, submitted to a slight fermentation in the heap previous to use.

Muck Composts.

The object of composting muck with various substances, such as manure, wood ashes, &c., is to start its further fermentation, and to liberate its plant food. It is obvious that those who have deposits of this naturally-occurring fertilizer convenient may at little cost largely increase their supply of manure, and restore to their land the humus and nitrogen which has been dissipated and used by continuous cropping.

Composts with Manure.—Spread on a level piece of ground a layer of the weathered and air-dried peat or muck, 6, 8, or 10 feet wide, and of any desired length, and 1 foot to 1½ feet in thickness. Cover with a layer of manure, say, 1 foot thick, and continue with alternate layers of muck and manure until the heap is 4 to 5 feet high, finally covering with a layer of muck. The proportions here given are to be considered as suggestions only, the principle involved being to use sufficient manure to set up active fermentation in the muck. Too large a proportion of the latter prevents the decomposition of the muck, which it is sought to bring about. Keep the heap moist, but at no time should it be saturated. An occasional watering in a dry season may be beneficial, and for this purpose liquid manure and house slops will be found valuable in assisting fermentation and enriching the compost. At the end of a few weeks—the period will largely depend on the season—the mass should be forked over and again covered with muck. This operation may be repeated at similar intervals two or three times. At the end of two, or possibly three, months the compost should be in excellent condition for application to the soil.

It will be obvious that any and all refuse on the farm of an organic nature, whether vegetable or animal, can be used advantageously for composting with these materials.

Composts with Wood Ashes, Lime, &c.—The growth of micro-organisms, which bring about the further fermentation of the muck, is retarded or altogether checked by the acid naturally present in the muck. On the other hand, a slightly alkaline condition favours fermentation, and it is, therefore, evident that wood ashes, lime or marl (alkaline substances) may be employed as composting materials.

Wood Ashes.—For every 100 bushels of muck add 10 to 15 bushels of wood ashes. Intimately mix by shovelling, and shape up into a compact heap, 3 to 5 feet high. If the muck is quite damp, no water need be added, but if it is dry, pour on a sufficiency to thoroughly moisten the mass. Finally cover with a few inches of muck, and leave the heap for, say, two months. It may then be reshovelled and again covered, moistening if necessary. Usually, from 4 to 6 months in summer time are required to bring the muck into a suitable condition for application to the soil.

Such a compost not only contains the plant food of the muck—now in more or less available condition—but also the potash, phosphoric acid, and lime of the wood ashes, and these greatly enhance its value as a fertilizer.

Lime.—Slake 10 bushels of quick-lime to a fine powder with brine made by dissolving 1 to 1½ bushels of salt in a sufficiency of water. This is then spread upon the muck in alternate layers, and the heap built up and treated as before described. For muck fresh from the swamp, use about 2 bushels of the lime to 100 bushels of the muck, for air-dried muck (to be subsequently moistened, if necessary), 10 bushels of lime to 100 bushels of the muck or peat.

Marl, gas-lime, and leached ashes may all be used for composting, using 20 to 25 bushels to the 100 bushels of muck.

TOBACCO REFUSE.

Tobacco stalks, and the stems (from which the leaves have been stripped) dried and powdered, constitute a fertilizer of considerable value by reason of the nitrogen and potash they contain.

Tobacco dust or refuse from the cigar manufactory is largely made up of powdered stems or leaf ribs, and, if not too largely mixed with inert matter, such as sand, sweepings, &c., is well worth the attention of market gardeners, fruit growers, &c., in the neighbourhood of tobacco factories.

This material, we are informed, may frequently be obtained for the hauling, or at a nominal price. If, however, any considerable figure is asked it would be desirable

to obtain some knowledge of its fertilizing value, as this may vary in different samples within very wide limits. A sample of the tobacco dust forwarded by Mr. L. S. Campbell, K.C., Montreal, and recently analysed by us, furnished the subjoined data:—

Analysis of Tobacco Refuse.

Moisture	7·45
Organic matter	63·09
Ash or mineral matter soluble in acid	8·69
" " insoluble in acid	20·77
	100·00

	Per cent.	Pounds per ton.
Nitrogen	1·27	25·4
Potash	1·36	27·2
Phosphoric acid	·34	6·8

As usually quoted by writers on agricultual chemistry, this material should contain from 1½ to 3 per cent nitrogen, and from 3 to 7 per cent potash. We suppose that in the sample here reported upon the lower values are due to the large amount of sand, &c., present. Nevertheless, it has distinct value, for at market prices of nitrogen and potash in equally available forms, it would be worth about $4 per ton for its plant food.

Though not, strictly speaking, a matter coming within the province of the Chemical Division to report upon, mention might be made here of the insecticidal properties of powdered tobacco leaves, stems, &c., used dry or in the form of a decoction or for fumigation. This material is largely used in the preparation of many insecticides now found upon the market and is especially advocated for the destruction of plant lice and other sucking insects.

REFUSE FROM A POTATO STARCH FACTORY.

The results of our analysis of a sample of this by-product, forwarded from Charlottetown, P.E.I., and stated to be thoroughly representative of this material, are as follows:—

ANALYSIS of Refuse from Potato Starch Factory.

—	As Received.	Calculated to Water-free basis.
Water	72·47	....
Organic matter	23·41	85·04
Ash or material matter	4·12	14·96
Total	100·00	100·00
Nitrogen	0·183	0·782
Phosphoric acid	0·046	0·17

These data show that the fertilizing value of this material is insignificant, though it might prove of value to soils lacking in organic matter. The percentage of nitrogen does not exceed that in many soils of average productiveness, and in phosphoric acid

this refuse is also decidedly low. It is evident, therefore, that this by-product could only be used locally with any hope of profit.

Undoubtedly, the best returns would be on light, sandy or gravelly soils, and used in conjunction with lime and marl.

CHEMISTRY OF INSECTICIDES AND FUNGICIDES.

KNO-BUG.*

So many inquiries regarding the nature and value of this newly introduced preparation have been received during the past season that its analysis was deemed desirable.

The packages sent in for examination were all of the same size and weight, holding 1 lb. of the powder. The printed matter upon the package states that it is a 'combined bug-killer and potato grower.' It further states 'Kno-bug is a preparation to destroy potato bugs and all other bugs that eat leaves, plants or vines. It not only destroy the bugs, but, unlike Paris green, acts as a vegetable tonic and stimulates the growth of the plant, prevents blight, scab and rots. Carpenter-Morton Co., Boston, Mass.'

It is a fine, earthy powder of a pinkish-red colour, but revealing under the microscope many particles of Paris green.

The analysis included a search for and determination of compounds that might act as insecticides, and also of those which would furnish plant food.

Analysis.

	Per cent.
Paris green	2·16
Nitrogen (present as nitrates)†	·729
Potash (soluble in water)†	2·44
Phosphoric acid	traces only
Ground gypsum (land plaster)	88·15
Oxide of iron (ochre)	3·67
Insoluble rock matter	1·32

This insecticidal compound, it will be seen, contains an amount of Paris green approximately equivalent to that in the 'dry mixture' recommended by entomologists for leaf-eating insects, and particularly for the potato bug. The formula on the spraying calendar of the Experimental Farm reads: '1 lb. of Paris green to be mixed with 50 lbs. of flour, land plaster, slaked lime or any other perfectly dry powder.' The vehicle, or filler, in Kno-bug being land plaster, shows that the manufacturers have in this case followed closely the teachings of those best qualified to advise in such matters.

There was no free arsenious acid present, or only mere traces, consequently this preparation could not injure foliage.

As regards plant food, analysis shows notable quantities of two important elements—nitrogen and potash—and these constituents are present as a compound which is soluble. They may, therefore, be considered as immediately available to growing plants.

The economy of using such compounds must depend largely upon their price, and in order to consider their value from this standpoint it would be necessary to know the prices at which the various ingredients could be bought. The latter are not necessarily the same for all purchasers. They depend upon the distance from large markets

* In this name is evidently incorporated the formula of saltpetre or nitrate of potash KNO_3, one of the constituents of this preparation.

† Equivalent to 5½ lbs. (approximately) of potassium nitrate (saltpetre) per hundred weight of Kno-bug.

and the quantities in which the materials are purchased. On making a comparison, however, between the cost of the ingredients and of the prepared article, the probability is that there will be found a very handsome margin to cover the cost of mixing, putting up, &c., of the latter. Thus, for the purpose of illustration, we may assume the following prices: Paris green, 20 cents per lb.; nitrate of potash, 10 cents per lb.; and ground land plaster, 40 cents per 100 lbs. At these prices, the ingredients in 100 lbs. of Kno-bug would cost, approximately, $1.35. In other words, this preparation would be worth, for its several constituents that make it of value, either as an insecticide or fertilizer, about 1½ cents per lb. The retail price of Kno-bug is stated to be 10 cents per lb.

In the case of condimental foods for stock, the price almost invariably exceeds very largely the cost of the various constituents, and the same is no doubt true of preparations for the treatment and feeding of plants.

BUG FINISH.

This is another preparation for the destruction of the potato bug. In its main features it is similar to the foregoing compound: that is, the base is gypsum, with a small quantity of Paris green as the insecticide. The essential elements of fertility, however, are absent. It is stated to be manufactured by 'Church's Alabastin Company, Paris, Ont.,' and to be retailed at 3 cents per lb.

In appearance, it is a grayish-white powder, showing under the microscope scattered particles of Paris green. On analysis we obtained the following data :—

Analysis.

	Per cent.
Ground gypsum	64·55
Carbonate of lime	7·14
Oxide of iron and alumina	2·30
Insoluble rock matter	17·51
Paris green	1·27

For those who prefer to use the 'dry powder' form of insecticide on potatoes, this compound no doubt will answer, though the percentage of Paris green is somewhat less than that recommended.

As regards the economy in using it compared with the home prepared powder, the remarks made in discussing Kno-bug are here equally applicable.

OWENS' COMPOUND FOR THE PROTECTION OF TREES AGAINST INSECT AND FUNGUS RAVAGES.

This material, which has been exploited to a considerable extent in Western Ontario, was brought to our notice last March by several prominent orchardists, who requested an analysis and a report upon the claims of the promoter. These claims are that not only will it protect the tree against all insect and fungus ravages, but that the general health and vigour of the tree will be improved. The directions for use are simply to bore a hole in the trunk of the tree and insert the powder. Presumably, the 'powder' is to enter into the sap circulation and that this will be effective in rendering the tree immune against all insects and fungi.

We were able to obtain several samples of this compound, some of which had been taken out of trees previously treated. The first sample, obtained in the neighbourhood of London, Ont., furnished on analysis the following data:—

	Per cent.
Sulphur	94·3
Charcoal (containing a little ash, &c.)	5·7
	100·00

A second sample of this 'Owen mixture used in the tree plugging process,' received some six weeks later, and obtained from another correspondent, was found to contain the same constituents in almost the same proportions:—

	Per cent.
Sulphur	90·18
Charcoal	9·82
	100·00

The third sample, also from Western Ontario, afforded on analysis the following data:—

	Per cent.
Sulphur	93·65
Charcoal	6·35
	100·00

It is evident, therefore, that though little care is taken by the vendor in obtaining always the same proportions, we may be sure that the chief constituent is sulphur, to which has been added 5 per cent to 10 per cent of charcoal.

It seems scarcely necessary to point out that such a mixture could not be of the slightest value in protecting the tree against the ravages of insects and fungi, or in stimulating growth. It would be absolutely inert and inactive, remaining in the tree where it is put (as we had an opportunity of proving) and incapable of entering into the sap circulation.

It is extremely problematical if any chemical could thus to any extent be introduced into the sap circulation—and certainly such is out of the question with insoluble substances, such as sulphur and charcoal. Further, if such were possible, there is no doubt but that a quantity sufficient to deter insects and fungi from attacking the fruit and leaves would materially affect the health of the tree, and in all probability cause its death.

From time to time, such methods or processes as the one under consideration are exploited—indeed, it is quite an ancient fraud—and we presume a number of people, especially those who wish to save themselves the trouble of spraying, are induced to purchase and make a trial. Such methods are always of the same general character, and equally without merit. Quite recently an effort was made to sell county rights in Ontario for the Royal Insect Destroyer, promoted by a Mr. Lester, of Roanoke, Va., U.S., the plan of operation being identical with that of the so-called Owen Process. On inquiry from a reliable source, it was learnt that this compound was a mixture of gunpowder, sulphur, copperas, and saltpetre.

FORMALIN,* FORMALDEHYDE.

This well known antiseptic, disinfectant and preservative is now extensively and most satisfactorily used in Manitoba and the North-west Territories for the treatment of seed grain for smut. It has been for this reason that we have undertaken the analysis of the more important brands of this material upon the market and now present the results. The following descriptions are copied from the labels on the bottles collected for analysis :—

No. 1.—Formalin, Chemische Fabrik auf Actien (Schering), Berlin.

* Formalin is the name copyrighted by Schering (Berlin) for a 40 per cent solution of formaldehyde. Merck, of Darmstadt, in the same way, for the same strength of solution uses the name Formol.

No. 2.—Solution Formaldehyde 40 per cent solution, Parke, Davis & Co., Walkerville, Ont.

No. 3.—Formaldehyde, 40 per cent solution, Lyman, Sons & Co., Montreal, Que.

No. 4.—Formaldehyde, Merck (Formol), Darmstadt.

These have been carefully analysed by the following four well known methods: The ammonia method, the cyanide method, the iodine method and the hydrogen peroxide method. All these, according to our experience are open to some objection, but the one in our judgment yielding the most reliable results is the last mentioned, and accordingly we shall only present the data from it:—

Percentage of Formaldehyde (by weight).

No. 1	36·1
No. 2	37·3
No. 3	37·2
No. 4	37·0

Nos. 2, 3 and 4 are practically identical. Our results go to show that great uniformity in strength prevails among the chief brands of this material for sale in Canada.

It is of interest to note that the data do not in any case show the presence of 40 per cent of formaldehyde, as advertised by the manufacturers. Upon consulting analyses by American chemists a similar result is to be generally seen, and we may, therefore, conclude that the strength of 40 per cent by weight is an approximation rather than a statement of an exact nature.

The specific gravity of the several solutions was taken with the following results:—

Specific Gravity at 15·5° C.

No. 1	1·0815
No. 2	1·0900
No. 3	1·0895
No. 4	1·0885

These are in accord with the determinations of formaldehyde above given, though somewhat at variance with those quoted in several standard works.

THE CHEMISTRY OF BEE-KEEPING.

THE STORAGE OF HONEY.

Our experiments towards ascertaining the best conditions under which honey should be stored, were begun in the season of 1902. These were with extracted honey, and the results showed that it seriously deteriorated if stored in any room with a moist atmosphere.

The experiment was conducted in December, a season when at Ottawa the air may be termed dry. The temperature of the laboratory in which the work was done, was from 65° F. to 70° F. In the subjoined table the term 'dry atmosphere' has reference to the atmosphere of the laboratory; the 'moist' or 'saturated' atmosphere was obtained by exposing water in a flat dish at room temperature, under a large bell jar. In this bell jar the honey, contained in a suitable vessel, was placed upon a scaffolding or frame-work.

Experiments on the Storage of Extracted Honey, 1902.

	Water, per cent.
Ripe honey, from capped comb, at beginning of experiment..	15·88
" exposed to dry atmostphere 1 month*..	14·24
" exposed to moist atmosphere 1 month*..	31·46
" exposed to dry atmosphere 20 days†..	13·84
" exposed to moist atmosphere 20 days†..	48·23

*Exposed in glass cylinder. †Exposure in evaporating dish.

We notice that the honey kept in dry air lost somewhat in moisture-content. At the close of the exposure period this honey was in excellent condition.

On the contrary, that which had been kept in the moist atmosphere (under the bell jar) had absorbed large amounts of water. It had become thin and watery, and before the expiration of the exposure period had begun to ferment. In the tall cylinder, the percentage of water in the honey had doubled; in the open flat dish, with its large surface of honey (the same weight of honey was used in each), the absorption was much greater, the original amount of water being increased from 15·88 per cent to 48·23 per cent. This demonstrates very well the exceedingly hygroscopic character of honey and the desirability of keeping it in a dry atmosphere.

We have repeated this experiment during the past season with extracted honey, with a similar result, and also have had under trial honey in the comb. The latter is also shown to deteriorate rapidly in a moist atmosphere. The plan of the experiment was as follows:—

Extracted Honey.—This was weighed into flat-bottom, open dishes and exposed for three weeks (1) to the air of the laboratory, (2) in an atmosphere saturated with moisture (under a bell jar) in the laboratory, (3) to the air in a pantry of a house on the experimental farm, and (4) to the air in the cellar of the same house—this cellar being fairly dry and ventilated. The temperatures in (1), (2), and (3) varied from 60° F. to 70° F., and in (4) from 50° F. to 60° F., during the period of storage, October 12 to November 3.

Comb Honey.—A similar series of honey in the comb, i.e., section, were exposed, the temperatures being those already stated and the period of storage the same.

The results have been tabulated and set forth in the following charts:—

EXPERIMENTS IN STORAGE OF HONEY, 1903.

Extracted Honey.

From October 12 to November 3.

Place of Exposure, &c.	Temperature.	Loss, (Water.)	Gain, (Water.)
	°F.	%	%
In laboratory (ordinary atmosphere) in open dishes...............	60-70	2·79	....
" (saturated ") "	60-70	....	26·80
In house (pantry) in open dishes...............................	60-70	1·81	....
" (cellar) "	50-60	....	3·38

Honey in Comb (sections).

From October 12 to November 3.

Place of Exposure, &c.	Temperature.	Loss, (Water.)	Gain, (Water.)
	°F.	%	%
In laboratory (ordinary temperature)	60-70	1·5 } 1·26 }	....
" (saturated atmosphere)	60-70	....	2·73 } 4·84 }
In house (pantry)	60-70	1·33 } 0·90 }	....
" (cellar)	50-60	....	1·13 } 0·76 }

Very little need be said in explanation of these results: their meaning is self-evident. The extracted honey exposed in the saturated atmosphere in the course of a few days showed marked signs of deterioration in quality, becoming thin and watery and beginning to ferment. At the end of the three weeks' period of experiment it was quite unsaleable, and indeed unfit for use as an article of diet. That which had been kept in the ordinary atmosphere (both in the laboratory and in the pantry) had not perceptibly altered in appearance or taste, and was in excellent condition. The cellar stored sample, at the end of three weeks, had begun to ferment.

While not suffering to the same degree as the extracted honey, that in the comb deteriorated considerably when placed in the cellar and still more so in the saturated atmosphere artificially provided in the laboratory. The latter before the close of the three weeks' period showed drops of water collected on the comb and had begun to mould. The comb stored in the pantry and in the laboratory at the end of the period of exposure was in first-class condition.

This investigation, therefore, covering two years' work, emphatically points to the desirability of storing honey—both comb and extracted—in a warm, dry atmosphere, such as may be obtained in an upstairs' pantry or room. Deterioration is sure to follow exposure in a damp atmosphere, and for this reason the cellar, no matter how dry it may appear, is not a good place in which to keep honey.

This work has been brought before the Ontario Bee-keepers' Association, and will be found in greater detail in the proceedings of that association for 1902 and 1903.

BEESWAX.

In the report of this Division for 1890, there was published an account of the examination of certain samples of 'foundation comb' found to be seriously adulterated with paraffin. These, it was stated, although sold in Canada, had been imported from the United States. Since that date, until the present no complaint, so far as we know, has been made by Canadian beekeepers regarding the quality of the 'foundation' sold in this country.

In March, however, of this year, a request was made by the Goold, Shapley & Muir Co., Brantford, Ont., for an analysis of certain beeswax they had purchased from the United States for the manufacture of foundation, on the ground of suspected adulteration. In the interests of the Canadian honey industry, it was deemed desirable to accede to this request, and the examination was made. The results pointed to the

presence of paraffin in all three samples, varying approximately from 25 per cent to 29 per cent.

Unlike the adulterated 'foundation' of 1890, these samples possessed a melting point practically identical with that of genuine beeswax, showing that the adulterant must be of the nature of ozokerite or cerasin—the former a naturally-occurring paraffin, and the latter its refined product.

We are informed that the firm in the United States on the receipt of our report made no demur to the return of the consignment, a decision at once acted upon by the Canadian manufacturers on learning from us that the wax was not genuine.

WELL WATERS FROM FARM HOMESTEADS.

Of the 85 samples received during the past year, 55 have been submitted to analysis, the remainder, either from being forwarded in dirty bottles or being insufficient in quantity, were not submitted to examination. Though the larger number of these waters were, as usual, from Ontario, samples have been received from all parts of the Dominion. For the most part they are from farmer's wells, but the series also includes a certain small number of natural spring and river waters used by farmers.

In the table of analytical data a very brief statement is made as to the general character of the water from the standpoint of wholesomeness (see last column). A more extended account or consideration of the data would not here be possible, but in reporting to the senders a fuller opinion has been given, accompanied by advice as to the purification of the water or the abandonment of the supply, as the facts dictated.

Broadly classifying the results, we find that 20 of the waters were returned as seriously polluted and dangerous to use for drinking purposes, 18 were reported as suspicious or probably contaminated to such a degree as to render them unwholesome and unsafe, 5 were designated as saline and for this reason considered non-potable, and 12 were adjudged free from all pollution, safe and wholesome.

We have for a number of years past taken the opportunity annually afforded by the presentation of the results of these water analyses to utter a protest, or rather a warning, against the use of polluted waters. By far the greater number of wells examined are undoubtedly receiving excrementitious matter, either by soakage through the soil or by surface drainage. This polluting material comes from the barnyard, privy or some similar source. This means that such waters contain readily putrescible matter and most probably—most assuredly in the summer time—are teeming with bacterial life. Some of these bacteria or germs may be harmless and have little or no effect upon the health of those who drink the water. But if the germs of disease by any chance find an entrance—and this is by no means an uncommon occurrence—they find therein all that is necessary for their rapid development and the water at once becomes most dangerous. The only safeguard the farmer has in such cases is to boil all the water required for drinking purposes. No system of household filtration is so effective as boiling the water. The boiled water, on cooling in a vessel, exposed to the air, will lose its insipidity, and become pleasant and palatable. If there is any suspicion as to the quality of the well water, either from appearance or smell, there should be no neglect in taking this simple but most effective precaution.

But apart from the possible presence of disease germs, there is a danger in such contaminated waters that must not be overlooked, namely, from poisonous organic compounds derived from the partial decomposition of the infiltrating sewage material. It seems very probable that these are in many cases responsible for various disorders of

the intestinal tract, diarrhœa, indigestion, as well as sick headache and general derangement of the system. If, therefore, it be established that the well is receiving polluting matter, in fact acting more or less as a cesspit, it should be abandoned, and at the earliest possible date.

The shallow well in the barnyard or close to possible sources of pollution is always a menace. At the very earliest possible opportunity a more distant and deeper source of supply should be sought and the old well abandoned. We do hope the day of the shallow well is passing away. The driven or bored well situated out of range of pollution from the farm buildings will, as a rule, furnish good water and an ample supply of it. With such a supply and a windmill pump the farmhouse and buildings can enjoy a water service at once wholesome, convenient and constant.

Farmers in doubt as to the purity of their well water may obtain an analysis and report of the same from the Chemical Division of the Central Experimental Farm, Ottawa. Directions for the collection of the sample (a matter of considerable importance) will be forwarded on application.

ANALYSIS OF WELL WATERS, 1903.

RESULTS STATED IN PARTS PER MILLION.

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
			1902.									
1	Ottawa East, Ont.	J.B., No. 3	Dec. 9.	·04	·19	7·70	32·5	508·0	302·4	205·6	None	Polluted, condemned as unsafe.
2	"	J.B., " 4	" 9.	·195	·38	9·45	75·0	509·2	286·8	222.4	"	" " "
			1903.									
3	Hazeldean, Ont.	H. H. A.	Jan. 22.	·045	·11	11·67	32·0	314·4	191·2	123·2	Traces	Seriously contaminated.
4	McAdam, N.B.	D. T.	Feb. 27.	·134	·39	·38	12·50	156·0	85·6	70·4	"	Suspicious.
5	Almonte, Ont.	J. F.	" 28.	·05	·19	8·24	34·5	450·0	274·0	176·0	"	Polluted.
6	Ottawa East, Ont.	F. X. L.	Mar. 2.	·03	·205	6·82	147·5	911·2	482·4	428·8	"	Undoubtedly contaminated.
7	Summerside, P. E. I.	R. H.	" 9.	·44	·46	8.72	40·0	277·0	175·0	102·0	H. ppte.	Seriously contaminated.
8	Ottawa, Ont.	T. G. B.	" 9.	·04	·127	10·37	10·3	549·6	346·8	202·8	V. H. ppte.	Undoubtedly seriously polluted.
9	Beulah, Man.	J. C., No. 1	" 23.	·016	·395	·003	28·0	3733·6	2756·0	977·6	H. traces	Free from organic pollution, saline
10	"	" " 2	" 23.	·85	·765	·239	70·0	5134·8	4233·2	901·6	Traces	Suspicious, saline.
11	Port Sydney, Ont.	A. L. F. B.	" 31.	·01	·11	1·35	2·0	38·0	12·0	26·0	None.	Wholesome, unpolluted.
12	Kilaloe Station, Ont.	J. W. P.	Apr. 7.	·89	·96	6·14	175·0	688·0	440·0	248·0	Traces.	Most seriously contaminated.
13	Nepean, Ont.	W. D.	" 14.	·045	·16	14·26	24·0	426·4	234·4	192·0	H. ppte.	Very bad water, unsafe for use.
14	Almonte, Ont.	L. C.	" 20.	·03	·11	3·36	3·0	267·2	196·0	71·2	"	Very suspicious.
15	Yorkton, Assa.	S. G., No. 1	" 20.	1·576	·28	None	122·5	2600·0	2115·0	485·0	Traces.	Suspicious, not suitable for drinking purposes.
16	"	" " 2	" 20.	·072	·41	"	15·0	712·0	458·0	254·0	H. traces	Probably safe and wholesome.
17	Chilliwack, B.C.	G. M. S.	" 28.	·02	·285	3·45	6·50	116·8	60·8	56·0	V. S. Traces	Very suspicious.
18	Almonte, Ont.	L. C.	May 2.	·028	·103	3·53	3·9	236·0	146·8	89·2	H. Traces.	Polluted.
19	Ottawa East, Ont.	J. B., S. Well	" 11.	·044	·186	5·01	7·5	132·0	60·0	72·0	"	Suspicious.
20	Hamiota, Man.	A. E. K.	" 12.	2·79	·145	None	31·0	2071·6	1627·6	444·0	Cons. traces.	Polluted, not suitable for drinking purposes.
21	Desbarats, Ont.	S. G. F.	" 21.	·05	·21	1·42	16·0	310·4	208·8	101·6	Traces	Very suspicious.
22	Stirling, Alta	C. B. R.	June 1.	1·59	·395	·076	49·5	2130·0	2082·0	48·0	S. traces.	Saline water.
23	Summerside, P. E. I.	F. B.	" 3.	Free	·038	1·29	10·0	137·6	116·0	21·6	V. S. traces.	Free from pollution, wholesome.
24	Almonte, Ont	L. C.	" 3.	·01	·095	2·174	4·5	296·0	229·6	66·4	" "	Suspicious.
25	Mansewood, Ont.	T. C., No. 1	" 12.	·01	·075	5·54	13·0	465·6	315·2	150·4	S. traces	Polluted.
26	"	" " 2	" 12.	·11	·044	18·19	32·5	534·0	239·6	314·4	"	"
27	Cutbank, Alta.	F. G.	" 23.	·889	·72	3·797	180·0	2528·0	1922·0	606·0	H. traces	Suspicious, not a good water.
28	Sheffield, N.B.	F. B. J.	July 4.	·02	·08	10·5	40·0	216·4	124·0	92·4	None	Polluted.
29	Meaford, Ont.	J. L.	" 18.	·595	·115		58·5	3068·4	2358·8	709·6	Traces	Seriously contaminated.
30	Hall's Glen, Ont.	E. E. P.	" 22.	Free	·18	·453	160·0	840·8	586·4	254·4	S. traces	" polluted.

31	Martintown, Ont...	A. W. U., No. 1.	" 24.	·01	·135	14·12	54·0	614·0	331·6	282·4	Traces..	Seriously polluted, dangerous for drinking.
32	"	" " 2.	" 24.	·02	·08	3·21	4·5	316·4	194·4	122·0	"	Wholesome, unpolluted.
33	St. Agathe, Man.	T. H.	" 27.	2·65	·305	....	4300·0	11508·0	8516·0	2992·0	Free	Saline water.
34	Sussex, N. B.	H. W. F.	Aug. 4.	3·99	·285	8·85	34·0	302·0	208·0	94·0	S. traces	Seriously polluted.
35	Picton, Ont	W. O. P.	" 5.	·117	·397	None...	9·0	393·0	258·0	135·0	Traces..	Probably contains drainage.
36	Hargrave, Man.	W. B. P.	" 7.	·068	·405	·006	39·0	525·0	348·0	177·0	H. traces	Not a first-class water.
37	Masonville, Ont.	A. H. C., No. 1.	" 12.	·08	·265	12·87	31·0	645·2	330·8	314·4	"	Unwholesome, polluted.
38	"	" " 2.	" 12.	Free....	·06	7·86	50·0	576·8	296·8	280·0	S. traces	Suspicious.
39	Urquhart, Alta.	P. McD.	" 13.	Free....	·265	·032	1·0	668·0	418·0	·250·0	Traces..	Free from pollution, wholesome.
40	Vankleek Hill, Ont.	K. McC.	Sep. 5.	·26	·19	·008	4·0	780·0	503·2	276·8	"	Suspicious.
41	Calgary, Alta.	Mrs. J. A. T.	" 10.	·25	·29	·369	7·0	328·0	234·8	93·2	"	"
42	McAdam, N.B.	J. W. H.	" 11.	·06	·12	2·85	7·3	120·0	74·4	45·6	H. traces	Possibly safe, but not a first-class water.
43	Guelph, Ont.	W. H., No. 1..	" 14.	·06	·247	·756	5·8	262·8	146·4	116·4	S. traces	From River Speed.
44	"	" " 2..	" 14.	·08	·214	·763	6·7	261·6	148·8	112·8	V. S. traces.	" "
45	Woodstock, Ont.	W. G. F.	" 24.	·058	·21	16·14	80·0	839·2	572·0	267·2	H. traces	Suspicious.
46	Martintown, Ont	A. W. U.	Oct. 1.	None...	·175	2·88	3·8	298·0	187·6	110·4	V. S. traces.	Probably a good and safe water.
47	Brackenrig, Ont.	T. W. K.	" 5.	·024	·124	·94	None...	42·4	23·2	19·2	V. H. traces.	Wholesome.
48	Balsam Hill, Ont	C. L. McC.	" 12.	·66	·215	·058	20·0	360·0	238·4	121·6	Traces..	Unwholesome, suspicious.
49	Moosomin, Assa.	J. H.	" 17.	·024	1·164	·158	175·0	11837·2	8538·8	3298·4	None..	Saline water.
50	Ottawa East, Ont	J. B., (S. Well).	" 29.	Free....	·15	2·71	5·5	172·8	94·4	78·4	S. traces	Shows a marked improvement on samples of May 11th.
51	Thamesford, Ont.	W. J.	" 31.	·562	·252	4·12	24·5	444·0	256·0	188·0	"	Very suspicious.
52	Newbury, Ont.	G. A.	Nov. 4.	·16	·195	8·57	55·0	642·4	396·8	245·6	Traces..	Seriously polluted.
53	Grenfell, Assa.	J. R.	" 6.	1·287	·315	·076	12·0	1572·0	1166·0	406·0	S. traces	Suspicious.
54	Sault au Recollet, Que.	R. P. J.	" 16.	None...	·10	5·259	4·75	250·0	134·5	115·5	H. traces	Wholesome.
55	Proctor, B. C.	J. W. F.	" 26.	Free....	·102	Free....	Free....	188·0	126·0	62·0	Free	Exceptionally pure water.

REPORT

OF THE

ENTOMOLOGIST AND BOTANIST

(JAMES FLETCHER, LL.D., F.L.S., F.R.S.C.)

1903.

OTTAWA, December 1, 1903.

Dr. WM. SAUNDERS,
Director of Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to hand you herewith a report on some of the more important subjects which have been brought officially under my notice during the past season.

The appreciation of the value of the investigations prosecuted by the officers of the Division is indicated by the large correspondence with farmers, fruit-growers and others in all parts of Canada. It is impossible in an annual report to deal with all the subjects which come up for consideration during the year. Many of these have already been treated of in previous reports, and the investigation of some is as yet in an incomplete state. Correspondents are constantly adding much to previously recorded facts concerning the habits of injurious insects, the utility of remedies, and the best way to apply them, the value of fodder crops, and many other subjects. The correspondence and replies relating to these are all carefully preserved and classified for future use. A complete index has been made of all letters which have been sent out from the division since the institution of the Experimental Farms up to the present time, which is of much use when working up afresh a subject which has been previously studied.

Fodder Plants.—The testing of grasses and other fodder plants, native and exotic, both in the experimental grass plots at the Central Experimental Farm and by correspondents, has been continued, and, as in the past, has been a source of much interest to all who have witnessed these experiments. The Awnless Brome Grass, the cultivation of which, from its introduction up to the present time, I have persistently endeavoured to encourage, has proved a great boon to farmers and stockmen in Manitoba and the North-west Territories. This grass is now recognized as one of the important staple crops of the West, where it is grown both for hay and pasture, as well as for the seed, which always meets with a ready sale. Attention has also been drawn to the value of various mixed crops for summer feed, and, following the experience of our Superintendents at the western farms, some farmers have grown with great satisfaction mixtures of pease, oats and wheat, one bushel of each to the acre; tares and oats, or pease and oats, one and a half bushels of each to the acre.

Lucerne or alfalfa has been tried to a certain extent in most of the provinces of the Dominion, and where care has been taken to prepare the land properly by ploughing deeply and then consolidating and smoothing the surface by harrowing, it has done

well in many localities where it had been thought previously that this most valuable clover would not grow. It is also most important that the land should be in the condition known by farmers as 'good heart,' that is, fit to grow a good crop of an ordinary farm crop. I feel confident that this fodder plant, which is of such immense importance in the semi-arid districts of the western States, both on ordinary farm land and under irrigation, is worthy of a much more extensive trial in the North-west and Manitoba than up to the present it has received. This, to a large measure, is also the case with the other well known clovers so extensively cultivated in the East, but which are considered out of the question as farm crops on prairie farms. All of these clovers may be found in many places along railway banks throughout the West, and, where they have been tried on farms, although the general result has been considered a failure, still there are many plants persisting and in some places increasing slowly year by year. It is now well known that the satisfactory cultivation of clovers is much affected by the presence of bacteria-containing nodules upon the roots, and that, if these be present in the soil, the vigour of the plant is much increased. This increase takes place more and more every year when clovers are grown upon new soil, the original bacteria, adjusting themselves to the clovers from nodules on roots of native leguminous plants, or, possibly, being carried with the seed. White Clover is thoroughly established in the streets of Winnipeg and some other Manitoban towns, where it is sown to crowd out coarse weeds along the boulevards and in the streets. This plant grows well also at Regina, Calgary, and many other places. Mr. Bedford, the superintendent of the Manitoba Experimental Farm, writes:—'On this farm, when sown without a nurse crop, Alfalfa, Common Red, Mammoth Red, Alsike and White Dutch Clovers form robust plants by fall, and do not fail to pass the winter successfully. I sow in spring without a grain crop, because, when sown with grain, alfalfa and other clovers, but particularly alfalfa, have been winter-killed, the roots produced during the first year being small and short. I have grown alfalfa since 1887.'

When travelling through the North-west Territories, I have frequently come across farmers who have small patches of alfalfa, some of these of three or four years' standing. and Mr. T. N. Willing, of Regina, who, as Provincial Weed Inspector, has exceptional opportunities of seeing what crops are grown on farms in all parts of the North-west Territories, and who, as a practical farmer, is well able to judge the value of crops, writes:—'I am sorry to say I am not aware of any one who is conspicuously successful with alfalfa on a large scale, although many have tried small patches, which have apparently given most promising results. Mr. W. Stevens, of Cloverbar, near Edmonton, has a patch in its second season, which wintered perfectly; when mowed at the end of July it was between three and four feet high and gave a crop estimated at from three to three and a half tons. Near Battleford, the late Mr. Laurie sowed alfalfa about 1884; the season was dry, but the plants struggled on in spite of drought and gophers; the farm was subsequently abandoned, but in 1900, the alfalfa area was still clearly defined and proved attractive to the cattle. Mr. Laurie was satisfied that this would have done well, had he been able to care for it better. A man near Boscurvis has grown alfalfa for three years, and it has constantly improved. Near Prince Albert it was grown for five years by Mr. Acorn, but was then killed out by a late spring frost.'

In view of what I myself have seen in the North-west, and of statements made by farmers who have tried it upon small areas, I have thought it wise to recommend farmers in the West to test alfalfa more thoroughly, doing so on small areas and sowing in spring at the rate of from fifteen to twenty pounds to the acre, without any nurse crop and upon land which had been summer-fallowed the year before. The first year all that would be necessary, would be to mow the weeds. If, in districts where there is a little more moisture than is found on the open prairies, it was thought desirable to mix with the alfalfa or clover any grass, decidedly the best kinds for this purpose would be the Awnless Brome or the Western Rye-grass, which might be mixed in the proportion of ten pounds of alfalfa to six pounds of the grass seed. Awnless Brome does

not as a rule make a very heavy growth the first season, and therefore it would not crowd out the somewhat delicate alfalfa seedlings, nor deprive them of too much soil moisture. The alfalfa, being a very deep-rooted plant, would be well suited for cultivation with either of these grasses, the root systems of which are much nearer the surface. I am glad to learn that the North-west government has secured from the Russian government a quantity of seed of the Turkestan variety of alfalfa, which will probably be distributed for testing in various localities next spring. This variety is merely a form of the common alfalfa which has been grown in Western Asia for a long time and has thus become accustomed to more severe conditions. I was fortunate enough to secure from the United States Bureau of Plant Industry some seed of the original distribution which was brought to America, and have a vigorous plot now growing from that seed. The two plants are almost indistinguishable, although the Turkestan variety is rather more vigorous in growth; but the leaves and flowers of both forms are similar.

Collections.—The collections of insects and plants in the Division have been very much augmented during the past year, many interesting additions having been made from material collected in the field, as well as through the kindness of correspondents who have sent in collections to be named by the officers of the Division. The success of the recent Nature Study movement in education has had a marked effect in increasing the interest in the subjects dealt with in the Division of Entomology and Botany, as has been evidenced by the large number of natural history objects which have been sent in with inquiries for information concerning them. These were for the most part insects and plants and came from teachers, students and farm children living in every province of the Dominion. I was much pleased to have the opportunity of distributing useful knowledge concerning these important subjects in this direct way to those for whom it was of so much practical value; and, moreover, from this source many valuable additions have been made to all of our collections. For several years material of all kinds has been accumulating from my own collections in the West, from the extensive breeding investigations into the life-histories of insects which have been carried on here, and from specimens sent in by correspondents for examination. During the past season many insects have been mounted and arranged in the cases, as well as plants in the herbarium, so that we have in the Division fairly good working collections which are now available for reference when required.

Insects.—The chief effort has been made to study and represent in the cabinets the various stages of those species which are injurious to crops, and those which are known to be beneficial. Much has also been done to build up the general scientific collections of the different natural orders of insects.

Plants.—Large additions have been made to the collection of native wild plants, and some hundreds of sheets have been mounted and arranged in the herbarium. These consisted chiefly of plants of various orders from the North-west Territories, from the Rocky Mountains, and from British Columbia. A good representation has also been secured of fodder plants, particularly of grasses. Agricultural weeds and poisonous plants, which are a subject of burning interest in the wheat lands of the West, and on the stock ranges, are well represented in our collections, and a recent improvement has been made by arranging the collection of seeds of weeds and other plants; this collection now contains seeds of about 450 species and includes nearly all of the weeds of importance in different parts of the Dominion. These samples have been of much service in identifying seeds found among seed grain and clover and grass seeds, sent in by farmers and seed merchants for examination as to purity and for testing as to vitality.

Insects of the year.—I am pleased to report that there have been no serious outbreaks of injurious insects during the season of 1903, nor have any new pests of importance made their appearance. One species of interest, but of no great economic im-

portance is the Rhubarb Weevil (*Lixus concavus*, Say), which was found injuring rhubarb at Harrietsville, Ont. There was, however, been considerable loss in various parts of the Dominion from regularly occurring insect enemies; and, where farmers have applied promptly the remedies recommended, great saving has been effected. The season, on the whole, has not been quite as propitious as usual for good crops. Until the middle of June, the exceptional drought which prevailed through eastern Canada, prevented the germination of seed of all kinds, which retarded the development of many crops and exposed them to attacks from insect enemies. Later in the year, cool damp weather prevailed, which again delayed maturity and was the cause of some loss. Some of the leading features of insect presence during the year were the following:—

Among cereal crops there were no widespread or very serious losses. Hessian Fly was reported as the cause of some loss in Prince Edward Island, at one place in western Ontario and in restricted localities in Manitoba and the North-west Territories. The Wheat-stem Sawfly was abundant and destructive, although little observed, in south-western Manitoba. The Grain Aphis appeared suddenly during July and August in enormous numbers throughout Ontario, in Manitoba and in the North-west Territories and was the cause of considerable alarm; happily, however, the parasites which usually control this species, appeared soon afterwards and eventually, owing to the excellent weather for the grain to fill which prevailed last autumn, the injury was unimportant. In Manitoba locusts did some harm, but this was far less than in previous years. Farmers throughout the district, assisted by the provincial government, applied the standard remedy, the Criddle mixture, and in every instance with most satisfactory results. Experiments undertaken with a view to destroying these insects in a wholesale manner with the fungous disease which has been used in other parts of the world, were without avail, and this, I find, has been the general outcome of most experiments of this nature. Occasional successes which have been reported, seem to have been largely due to exceptionally advantageous atmospheric conditions at the time of the experiments. An outbreak which caused widespread alarm in Manitoba, was by the caterpillars of two broods of a common prairie moth, which this year appeared in vast numbers and, having consumed all of their natural food plant, the common weed known as Lamb's Quarters, ate many other plants, amongst which were some kinds of garden plants. This insect was the pyralid known as the Sugar-beet Web-worm (*Loxostege sticticalis*, Linn.).

Root crops and vegetables were diminished to a certain extent by the ordinary pests of the field and garden. Cutworms of various kinds were reported during the dry spring weather from all parts of the Dominion, and where not controlled did much damage. Root maggots, as usual, were irregular in their appearance, but in most places were the cause of great loss amongst onions, radishes, cabbages and turnips. The Colorado Potato Beetle was noticeably less abundant in most places. The Asparagus Beetle, a recent importation into Canada, although not a cause of much loss, has gradually extended its field of destructiveness, and last summer was reported as far east as Toronto.

Fruit crops generally have been good and remunerative, growers in all districts are seeing more and more the advantage of practising such common sense factors of success as spraying for the prevention of insect enemies and fungous diseases. The San Jose Scale has been held in check to a satisfactory extent wherever instructions of specialists have been followed, and although this insect has not spread beyond the limits of the previous year's infestation, the injury done and the future danger from its work are very great. The work of the Oyster-shell Bark-louse has been much complained of in New Brunswick, Nova Scotia and Ontario. The Pear-tree Flea-louse has been locally in Ontario the cause of considerable loss and has for the first time this year been recorded from Nova Scotia. The Pear-leaf Blister-mite is abundant in British Columbia and occurs now in every province of the Dominion. When trees have been sprayed just before the buds burst, with the lime, sulphur and salt wash, good results have followed. Plant-lice of various kinds were rather more abundant than

usual on apple, plum and cherry trees, but were in most cases destroyed by parasites before much damage was done. The Tent Caterpillars, Cankerworms and the Codling Moth were noticeably less troublesome last season than for some years.

Shade-tree and forest insects were seldom referred to in correspondence, and few serious attacks were observed. In Montreal, Kingston and Toronto the White-spotted Tussock Moth has increased so much that remedial measures are now urgently needed or the beauty of shade trees in these cities will be much marred at no distant date. A remarkable outbreak of the Maple Soft Scale, *Pulvinaria innumerabilis,* Rathvon, took place on the street shade-trees last summer in London, Ont., causing much inconvenience to foot passengers, and the same insect also occurred on the shade-trees in Woodstock, Hamilton, and some other towns in western Ontario. The Negundo Plant-louse disfigured shade-trees to some extent in Winnipeg, Regina and Calgary, but not to a very serious extent. An insect which has gradually increased in abundance and now is destructive over a wide area in Canada, is the Spruce Gall-louse represented in the East by *Chermes abietis,* L., and in the West by *Chermes sibirica,* Cholodk. On small ornamental trees, spraying with a tobacco and soap wash has been effective, but in forests nothing can be done to check the ravages. There are, however, indications in some places that good work is being done by parasites. The unsightly nests of the Fall Webworm have become conspicuously more abundant lately than they have been for several years, and already demand attention from municipal authorities in towns, as well as from fruit-growers in many parts of Ontario and Quebec, as also in British Columbia. The insect occurs right across the Dominion.

Live Stock.—The Cattle Horn Fly, which a few years ago caused such extensive losses to dairymen and stockmen in eastern Canada, has now reached the Pacific coast. Although still occurring in some numbers in the eastern provinces, its most severe attacks in 1903 were in British Columbia, where I found it last summer extremely abundant in some localities on Vancouver Island. Cattle-owners were not prepared to use the remedies which have proved to a large measure effective in the East ; but, when these were applied, relief was soon apparent. The most convenient remedy in our experience, is to smear the animals on the parts most attacked with a light dressing of pine tar, one pound mixed with five pounds of lard or half a gallon of fish oil.* Specimens of the fly were sent from Regina by Mr. Willing, which he had taken on horses; but I saw no annoyance either to cattle or horses during a long journey through several of the cattle districts of the North-west in June and July last. I am hopeful that it is hardly likely this insect will ever be a very serious pest of stock in the dry regions of the West, where the cattle droppings, in which only the fly propagates while these are in a semi-fluid condition, dry up so quickly that they are soon unsuitable for the larvæ to live in.

Meetings.—Whenever official duties would permit of my absence, no opportunity has been lost of meeting farmers and of attending meetings of farmers' institutes and agricultural associations of various kinds. The subjects treated of at these meetings were as stated below:—

December 26 to 29, 1902: Washington, D.C.—Association of Economic Entomologists: 'Can the Pea Weevil be Exterminated ?'; 'Injurious Insects of the Year in Canada.'

Through the kindness of the President of the Association, a special discussion was held on the former of these papers, and co-operation was promised by several of the entomologists at the United States experiment stations, in disseminating information and in applying remedies for the Pea Weevil in those States where pease are grown for seed.

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* This mixture contains twice as much pine tar as in former recommendations. We have found that it keeps off the flies much longer than the old mixture of 1 lb. in 10 lbs. of lard.

December 29, 1902: Washington, D.C.—Society for the Promotion of Agricultural Science: 'Co-operation in Fighting Insects.'

January 5, 1903.—A series of addresses on the Value of Nature Study in Schools was given at the school houses in the following places: January 5, Harmony, Cedardale and Oshawa. January 6, U. S. S. No. 4, Whitby; U. S. S. No. 5, Whitby and Kinsale. January 7, U. S. S. No. 1, Pickering; U. S. S. No. 4, East Pickering and Pickering Village. January 8, Pickering, Frenchman's Bay and Dunbarton. January 9, Audley, Brock Road and Cherrywood. January 10, a large meeting in the town hall at Whitby. At all of the above meetings I was accompanied by Mr. W. A. Dent, who delivered most interesting addresses upon the habits of birds. These meetings were organized to help the children of this district in competing for the prizes offered by the Live Stock Commissioner at the Whitby Model Fair.

February 18 : Toronto.—Canadian Association of Fairs and Exhibitions : 'The Value of School Children's Exhibits at Fairs.'

March 6 : Pembroke High School.—'The Value and Pleasure of Natural History Studies.'

March 16 : Toronto.—Canadian Institute : 'Rocky Mountain Plants and Insects.'

March 18 : Cowansville, Que.—(1) 'The Brome Corners Weed Exhibit and its Lessons'; (2) 'Fodder Plants Suitable to the Eastern Townships'; (3) 'Spraying to prevent Insect Injuries.'

March 21 : Toronto Teachers' Association.—'Nature Study, What is it ?'

April 3 : Renfrew.—'Why should boys and girls study Nature ?' A mass meeting held in the city hall. Renfrew Horticultural Society : 'What Everyone can do to Improve the town he lives in.'

May 11 : Hamilton Horticultural Society.—'Seasonable Hints on Insect Enemies.'

May 14 : St. Catharines district.—Examining orchards which had been treated with the McBain Carbolic Insecticide for the destruction of the San José Scale, in company with some members of the Ontario Fruit Growers' Association.

June 15 to August 21.—In the West, investigating an outbreak of locusts in Manitoba, and holding a series of farmers' meetings in the North-west Territories and in British Columbia.

September 3 and 4 : Ottawa.—Entomological Society of Ontario : 'Insects Injurious to Ontario Crops, 1903' ; (2) 'Entomological Record for 1903.' At this meeting a paper was also read by my assistant, Mr. Gibson, entitled 'Basswood, or Linden, Insects.'

September 16 : Whitby.—Attending the Central Ontario Model Fair and judging the natural history exhibits sent in by school children. Delivered an address in the evening at a public meeting upon 'The Children's Exhibits at the Fair.'

September 29 : Richmond.—Opening the Model Fair for Eastern Ontario. Address: 'Model Fairs and their Management.'

November 25 and 26: Leamington, Ont.—Ontario Fruit Growers' Association: (1) 'Insects Injurious to Fruit Trees and how to Fight them'; (2) 'Insects affecting House Plants.'

Correspondence.—The correspondence of the Division has been of the usual varied nature and as heretofore has taken up much of the time of the officers. Many of the letters written are practically articles upon special subjects which are suitable for publication in the press, and have frequently been made use of for this purpose, in that way reaching a larger number of interested readers than could be done by direct correspondence. From December 1, 1902, to December 1, 1903, the number of letters, exclusive of circulars, registered as received is 3,150, and the number despatched, 2,664.

Acknowledgments.—As in previous years, I take pleasure in gratefully acknowledging my obligation to many correspondents, to practical farmers who have much aided the work of the Division by promptly reporting outbreaks of injurious insects and

noxious weeds, and for making, at request, special observations upon these. I must particularly mention in this connection, Prof. John Macoun, of Ottawa, who has on many occasions helped me with the identification of specimens, and also Dr. L. O. Howard, the U.S. Entomologist, Dr. Harrison G. Dyar, of the U.S. National Museum, and Mr. B. T. Galloway, of Washington. My thanks are also specially due to Dr. J. B. Smith, of New Brunswick, N.J., who has examined and named for me large numbers of Noctuidæ taken in Canada.

In conclusion, I take pleasure in again testifying to the excellent work done by my assistants, Mr. J. A. Guignard, B.A., and Mr. Arthur Gibson, to whose loyal and careful work much of the success of the work of the Division is due.

I have the honour to be, sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist to the Dominion Experimental Farms.

DIVISION OF ENTOMOLOGY.

CEREALS.

Weather conditions during 1903 in all parts of the Dominion have been somewhat unusual, and crops of all kinds, particularly cereals, have suffered somewhat from this cause. Crop reports from the eastern provinces record a prolonged spring drought with frosts in some places, which in Prince Edward Island and Nova Scotia somewhat thinned fruit crops and retarded growth of hay and pastures. A noticeable absence of injurious insects, with the one exception of cutworms, is mentioned by numerous correspondents in the maritime provinces. In Manitoba, conditions at sowing time were exceptionally favourable and all crops were got in and started well. The weather up to the middle of May was somewhat cool, and there was not much growth of grass and no trees were in leaf. After that time copious rains fell, which germinated all seed and gave promise of an enormous crop. The dry June which followed, with only light showers in July, checked the growth somewhat and, in districts where there was too little rain, grain was prematurely ripened. The result was that crops were rather lighter than usual, and in some districts both in Manitoba and the North-west Territories, where rain fell late in the season, crops did not ripen early enough to escape injury. The handsome gross yield, however, of fifty-seven million bushels of wheat, with an average of over 18 bushels to the acre, in conjunction with the higher price of wheat, gave the farmers of Manitoba and the North-west good returns for their work. In British Columbia Mr. J. R. Anderson reports that all grain crops were good and free of injury by insects. In Ontario the growing of wheat has decreased considerably during the last two or three years. This is doubtless due to losses from the Hessian Fly. In 1900, 1,068,000 acres were put in to fall wheat and 377,000 to spring wheat, while in 1903 only 665,000 acres of fall wheat were sown, with 248,500 of spring wheat. Prof. James, in his November crop report, for Ontario, says: 'The yield of fall wheat per acre is large and the quality of the grain is, as a rule, first class. Taking both yield and quality into consideration, the crop of 1903 may be considered as one of the best in the history of the province. There has been a greatly increased area of wheat sown this fall, more particularly in the Lake Erie district and other localities where the Hessian Fly did so much injury during the previous three or four years. The crop of spring wheat may be counted as above the average, although not so good relatively as fall wheat.' Oats, in all parts of the Dominion, were a heavy crop, but in some places were late in maturing and rather light in weight. No injury by insects, either to this cereal or to barley, was mentioned, and only very few references were made to rust, notwithstanding the heavy rains in some districts. The season of 1903 was not very favourable for corn. Seed planted early did best; that which was put in at the ordinary time, germinated very poorly from lack of rain and was consequently late. The long open autumn, before severe frost came, gave an opportunity for the crop to mature well, and most of it was saved in good condition, both for the bin and the silo.

Pease, which for several years have suffered so severely from the Pea Weevil, were grown to a much smaller extent in Ontario than for many years. In 1903 there were 125,-500 acres less land sown to this crop in Ontario than in 1902; but the crop reaped was 1,-259,971 bushels above that of 1902, with an average of 22 bushels per acre, against 14½ the previous year. This improvement, it must be acknowledged, is to some extent due to the campaign against the Pea Weevil, organized by the officials of the Ontario Department of Agriculture and this Division. Many farmers and others who grew pease, demanded from their seedsmen seed pease which had been treated to destroy any

living weevils which might be contained in them, and the present satisfactory state of affairs emphasizes the importance of treating all seed before sowing it, and of insisting that all who sell pease should attend to this matter. If a little more effort is now put forth, I see no reason why the Pea Weevil should not be entirely wiped out in Ontario. The remedies which will, in my opinion, effect this, were given at length in my last report, and consist of sowing early, so as to hurry on maturity as soon as possible, reaping directly the crop is in a fit condition, threshing and fumigating with bisulphide of carbon at once and then bagging up the seed and keeping it in bags until required for use. If it is not considered convenient to fumigate the seed before sowing, all the weevils can be destroyed by sprinkling a little coal oil or turpentine over the seed and turning it well for two or three days before sowing, or the seed may be held over till the second year, when it will be quite free from weevils, because these always emerge at latest by the spring of the year following the season when they develop.

The GRAIN APHIS (*Nectarophora granaria*, Kirby=*Siphonophora avenæ*, Fab.).—The only insect which was complained of as having occurred in undue numbers on cereal crops during the past year was the well known Grain Aphis, or 'green fly.' There is no doubt that where this occurred early in the season some injury was done to growing wheat and oats, but for the most part, although the aphides were exceptionally abundant, the usual parasites accompanied them, and in a short time they entirely disappeared.

'Aweme, Man.—The Grain Aphis was extremely abundant on wheat and oats this year. They attracted our attention during the first week in July and later they were so plentiful that they wetted all the front part of the binder canvases, on which they could be gathered up in handfuls. Mr. Sutcliffe, of Treesbank, tells me that they were so abundant on his oats that they actually stopped the binder. On looking beneath the canvases, he found the rollers simply packed with smashed up plant-lice. These insects undoubtedly did considerable harm this year by sapping the vitality of the plants, thus preventing the heads from filling as well as they should have done. As usual, numerous parasites were present with these and the many other kinds of aphis which appeared on various plants this year. By the end of the season, the parasites had almost exterminated these.'—NORMAN CRIDDLE.

Samples and reports of the presence of the Grain Aphis were sent in from many places in Manitoba and eastern points in the North-west Territories, as well as from a few places much further west. It was reported as being unduly abundant in Manitoba, at Bagot, by Mr. Eli Roberts; at Portage la Prairie, by Mr. James Thompson, and at Miami, by Mr. Thos. Renwick, who spoke of it as general throughout that district. The farthest point west where injury was done was at Beaver Dale. N.W.T. (34.26.7 west of 2nd meridian), from which place specimens were sent by Mr. Geo. Fernie. At Ottawa large numbers of the Grain Aphis were found on wheat and oats at the end of July, and it was noticed in the experimental plots here that certain varieties of wheat were more attractive to the insect than others. As a general thing, the bearded varieties were found in this observation to be much less infested than bald wheats. In every instance, large numbers of parasites were found present with specimens sent in for examination. In our Ottawa fields these were represented by the following species of Hymenoptera: *Asaphes vulgaris*, Walk., *Lygocerus niger*, How., *Xystus* (Allotria) *tritici*, Fitch, *Aphidius avenæ*, Fitch, *Pachyneuron*, sp. There were also numerous specimens of the common coccinellids *Adalia bipunctata*, L., *Hippodamia convergens*, Guér., and the Thirteen-spotted Lady-bird Beetle (*Hippodamia 13-punctata*, L.), and of the Hovering Fly *Syrphus ribesii*, L.

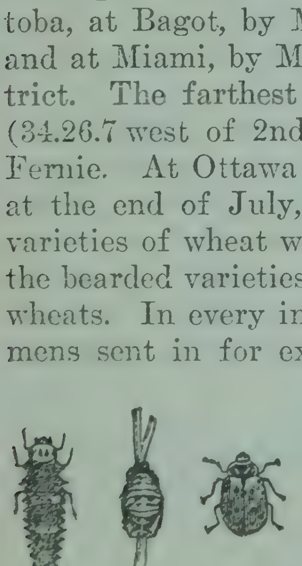

Fig. 1.—Lady-bird Beetle: *a*, larva; *b*, pupa; *c*, perfect insect.

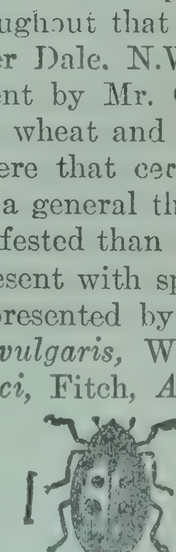

Fig. 2.—The 13-spotted Lady-bird Beetle—enlarged.

WHEAT-STEM SAWFLY *(Cephus pygmæus,* L.).—An insect which appears in a rather intermittent manner in Manitoba and the North-west Teritorries is the Wheat-stem Sawfly. Although present in considerable numbers in a locality one year, it seldom appears again in the same place the following year. It has from time to time been reported from Central Manitoba right across the plains to the Rocky Mountains. There are, I believe, other species of *Cephus* which attack various grasses in the West. In 1902, Mr. Norman Criddle sent me from Aweme, Man., a large number of stems of two grasses, *Ammophila longifolia* and *Agropyrum caninum*, which were attacked by Cyphid larvæ. Judging from the colour—one was bright yellow and the other white like the Wheat-stem Sawfly—there were at any rate two species ; but, unfortunately, I failed to rear any of the flies from the large amount of material sent me by Mr. Criddle. During the past season I received several infested wheat straws from Mr. John Davis, of Waskada, Man., who wrote :—

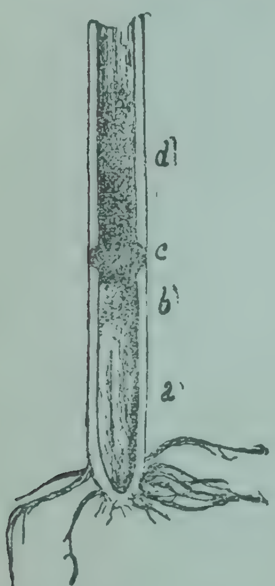

Fig. 3.—Wheat-stem Sawfly : *a*, cocoon, *b*, borings.

August 19.—I am sending you a few stems of wheat which I and many others here would like you to report upon. You will notice that some of the straws are broken or bent down three or four inches from the ground. The cavity of the straw is full of fine dust, and there is a small white grub about half an inch in length. This I have generally found low down quite near the root. It is very general through this district, but is not very destructive. The straws fall as they get dry, and where the attack is slight it might easily pass unnoticed. I have one field of 45 acres summer-fallowed last year. We were estimmating this to yield 30 bushels to the acre. There is about 5 per cent of this field down. I have not seen any other field so badly attacked as this is, but I have not seen any field about here that is quite clear of injury. It is a new pest here, and no one seems to know anything about it.'

This insect has provisionally been named *Cephus pygmæus,* L., and it certainly bears a close resemblance to that European species; but there are some points in its habits and life-history which do not agree, and it is just possible that the insect which occurs in our North-west may be a native grass-feeding species which occasionally attacks wheat when it finds that plant in a suitable condition at the time the females are laying their eggs. This can only be proved by carefully rearing a large series of the insects. The perfect insect is a shining black four-winged sawfly, banded and spotted with yellow, and having the abdomen slightly compressed. The head is large, with prominent eyes, the antennæ slightly club-shaped and composed of about 20 segments. The female is rather larger than the male and less ornamented with yellow. The average length of this fly is about one-third of an inch. The eggs are laid probably about the 1st of July, just before the wheat comes into head. They are inserted into the hollow of the stem by means of the female's saw-like ovipositor. The egg hatches in a few days, and the larva grows rapidly; before the straw ripens and hardens it will have eaten its way from the topmost joint of the stem to the lowest, feeding on the substance of the knots and on the inside tissues of the straw. About the time the grain ripens, it goes down to the lowest joint and gnaws away the inside of the straw so as to cut a ring almost, but not quite, through to the outside. This is just above or at the surface of the ground. The larva then burrows further down into the base of the stem and spins a very fragile skin-like cocoon, in which it remains unchanged until the following spring. The date of appearance of the perfect insect varies with the season and locality. I have taken specimens by sweeping, both in grain fields and on the prairie, from the last week of June to the middle of July. As all the larvæ pass the winter in the base of the straw, remedial measures must aim at treating the stubble

so as to destroy them or the pupæ before the flies emerge. I have suggested that this may be done either by ploughing deeply or by burning over the stubbles. As a few of the cocoons occur high enough up in the straw to be cut with the grain, all straw which cannot be used during the winter should be burnt.

The HESSIAN FLY (*Cecidomyia destructor*, Say).—This destructive insect, which a few years ago was the cause of such extensive loss in the fall wheat-growing districts of Ontario, was hardly noticed during the past season. Prof. Lochhead, of the Ontario Agricultural College, writes : 'This pest of wheat, barley and rye is no longer a serious enemy in the province. It has only been observed in one or two localities during the past season. In the vicinity of Georgetown it did much damage in wheat grown on stubble. A correspondent writes : "In good crops very little harm was done. On one occasion, in passing along the road, I noticed in a badly injured field that there was one very luxuriant patch of grain. I examined this patch, where evidently a pile of manure had lain, and found that the straw and grain were in good condition. I could not find a single stalk infested by the Hessian Fly." Most farmers are practising late sowing, that is about September 15. This probably had a good deal to do with the disappearance of the Fly.'

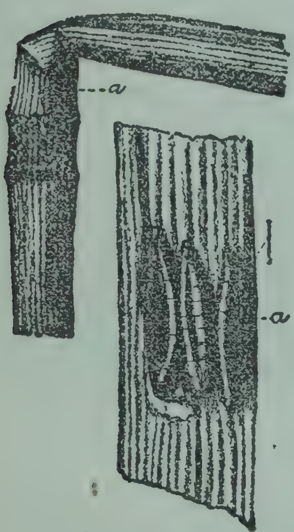
Fig. 4.—Hessian Fly: injured wheat-stem; 3 puparia—enlarged.

Reports from Prince Edward Island show that the Hessian Fly was noticeably present in several localities, and Mr. E. J. McMillan informs me that there was a considerable amount of loss in some places. In the West, Hessian Fly was mentioned quite frequently in correspondence from Manitoba and the Territories, but I believe that there was a confusion, in some instances at any rate, with the work of the Wheat-stem Sawfly. The only account of a serious outbreak was from Beulah, Man., where Mr. A. J. Dennis reports that 'the Hessian Fly has been much thicker this summer than I ever saw it.'

On the whole, however, there was probably not quite so much injury in Manitoba this year from Hessian Fly attack as in 1902. As has been frequently stated, there is normally only one annual brood of the Hessian Fly in Manitoba; consequently, the remedy is comparatively simple as compared with Ontario and the eastern provinces, where the insect is carried over in fall wheat. When Hessian Fly is known to be present in a district the grain should be cut high and the stubble burned over or ploughed down in autumn, and straw should be fed or burnt before the time the flies emerge the following spring. Screenings and rubbish from threshing machines should be put where poultry can get at them or where they will be trampled into the ground during the winter by stock.

LOCUSTS.

Locusts, or grasshoppers, which have been the cause of much anxiety in Manitoba during the past three years, again appeared last spring in the same localities as previously. They were so abundant that the provincial Minister of Agriculture again thought it wise to help farmers with advice and to supply Paris green for poisoning them with. Mr. Hugh McKellar, the energetic Chief Clerk of the Department of Agriculture, by instruction of his Minister, visited the infested districts and made arrangements for the distribution of poison. This was taken advantage of by many farmers, who used the Criddle Mixture with great satis-


Fig. 5.—The Rocky Mountain Locust.

faction. Some farmers who had read in the newspapers of experiments in treating grasshopper outbreaks with parasitic fungi, asked that some experiments of this nature might also be tried in Manitoba. The idea of treating outbreaks of injurious insects by means of introducing parasitic insects or fungi is an exceedingly attractive one, and, to those who have never studied these matters, is apparently a very easy solution of a difficult problem. Knowing that many of our leading American entomologists and botanists had made extensive experiments in this direction, but that nothing was being done by these students at the present time, I had not any very sanguine hopes of securing great success in Manitoba; but, as there certainly was a chance of doing good work for the province, I endeavoured to procure some cultures of the so-called South African Grasshopper Fungus for this purpose. After correspondence with many who had experimented, I at last succeeded, through the kindness of Dr. Howard, the United States Entomologist, in obtaining six tubes. These I took with me to Manitoba in June last and placed them in the hands of Mr. Norman Criddle, a careful experimenter and asked him to follow closely the instructions which accompanied them. This work was begun while I was with him and carried out by Mr. Criddle during the summer. Notwithstanding every care, this experiment must be recorded as a failure. I append herewith Mr. Criddle's report upon his work with locusts during the season of 1903.

LOCUST NOTES FROM AWEME, MAN., 1903.

By Norman Criddle.

There has been throughout this part of the country a marked decrease in the number of locusts during 1903, especially where they were poisoned last season. All the early damage done, which amounted to very little, was owing to many of the stubble fields being last spring devoid of all vegetation, and consequently locusts were obliged to attack the grain much earlier than they otherwise would have done. The first hoppers noticed hatched out on the 3rd May; they were becoming quite numerous by the 5th, and on the 12th the majority were out. They then began to do harm. By the 15th they had swept into some fields in millions, I think, thicker than I had ever seen them before. They had in three days marched 200 yards. Up to this time a small amount of damage was done; but this was principally owing to carelessness, and the insects were soon got under control with poison. By the 5th June most of the locusts had passed the third stage and, owing to the hot weather, it required a good deal of exertion to keep them from the growing grain. Wherever poison had been spread, countless numbers were found lying dead about the edges of the fields. At this period quite a number hatched in the wheat fields, the eggs having evidently been laid on summer-fallow last year. On June 13 most of the locusts were in the fifth stage, and the first one was noted with wings. By July 2 two-thirds could fly and some of them began migrating. By July 6 they could nearly all fly, and many of them flew into the crops. It is at this time that the second stage of the fight begins; the locusts, flying to all parts of the crop, eat the heads of grain. Fortunately, they soon collect into the sunny places, such as where the seeder has missed or any other open spot, so that, by walking up and down the fields, these places can be found and poison spread there. In fact, I am inclined to believe that in localities where locusts are troublesome it would be a good plan to miss a foot or so when drilling for the insects to collect upon. The migrating season was over by July 15, the weather at that time being cold and unfavourable for flying, so that very few left the neighbourhood. On August 1 the first female was noted laying eggs, although egg-laying did not become general until the 11th of that month, from which date eggs were deposited continuously until all these insects had disappeared. This they began to do about September 1, gradually getting less, until by October 3 they had nearly all disappeared. A few remained until the winter set in. The locusts responsible for damage this year were the same as last, and in the same proportion.

These were the Lesser Migratory Locust *(Melanoplus atlanis,* Riley), Packard's Locust *(M. Packardii,* Scudd.), the Two-lined Locust *(M. bivittatus,* Say), and the Rocky Mountain Locust (*M. spretus,* Uhler).

There is no doubt that the cause of the decrease in locusts was largely due to the co-operative work of farmers with Paris green, added to the increase of two species of Blister beetles, *Epicauta sericans,* Lec., and *Epicauta pennsylvanica,* DeG. This year the first of these insects were seen on June 1, and by the 4th of that month they had become abundant. *E. sericans* occurred on the dry prairies and *pennsylvanica* in somewhat damper spots, wherever the Wild Pea *(Lathyrus venosus,* Muhl.) is plentiful. *E. pennsylvanica* did considerable damage to potatoes and broad beans, but *E. sericans* is in no way injurious; it is, on the contrary, beneficial, as it seems to confine itself almost entirely to lamb's-quarters, though I have seen them actually eating wheat when other food was not to be found. The native food plant appears to be the Crocus Anemone, *Anemone Nuttalliana,* Gr., which I have often seen them eating. These beetles had all disappeared by August 28. That these two species of insects will be the cause of a still greater decrease of locusts next season is, I think, little to be doubted; for, although there are still numerous fertile eggs in some places, and notwithstanding that many locusts remained alive late into the season and there were an enormous number of eggs deposited, still, from observations I have made, I find that at least two-thirds of the eggs have been destroyed by Blister beetles. Of 141 pods examined, the eggs of 97 were destroyed. Of other locust parasites, there was an increase of tachina flies, and the Locust Mite seems to be rather more plentiful than usual. Another friend was Franklin's Gull, *Larus Franklinii.* During the migratory season, between July 26 and 31, thousands of these birds were to be seen flying up and down the fields, particularly on the summer-fallows, busily engaged in picking up locusts. Unfortunately, they were too late to prevent many of the females from laying eggs, although, of course, they did an immense amount of good.

Some damage was caused from locusts eating binder twine; very few had bluestoned the twine, and we have now been able to demonstrate without a doubt that some brands of binder twine are much more subject to attack than others. Whether it is that certain brands are made of different material or that they are looser than others, I cannot say; but the twine which was most attacked is very loosely twisted.

With regard to what you have called the Criddle Mixture, numerous tests were made with Paris green during the season to ascertain as accurately as possible the strength required to kill locusts, and it was found that one pound of Paris green could be mixed with five patent pails of horse droppings with absolute success. Weaker mixtures were not quite so successful. In the past, I believe, a large amount of Paris green, as well as labour, has been wasted through putting out the mixture in cold or wet weather, whereas I find that practically no feeding takes place in the spring with a temperature below 50°F. It is on the hottest days that locusts eat most, and consequently are most easily poisoned. In the early stages locusts much prefer the mixture moist, and I have found that spreading a little every other day, in the morning, gives much better results than scattering a lot at a time, and less frequently. Another advantage of spreading lightly is that the danger of cattle eating it is greatly lessened, whereas when put in lumps the danger is claimed to be considerable.

I regret to say that some cases of cattle poisoning were brought to my notice during the season. Though in every case the loss was the result of either ignorance or gross carelessness, in some cases, through spreading the mixture in too large lumps, or even putting it in pasture fields, or through leaving the barrel or whatever it was mixed in, where cattle could get at it. As I have said more than once, if the mixture is only scattered properly, there will be practically no danger. A good preventive measure is to keep cattle well salted. As Mr. McKellar remarked, 'Some farmers are overgenerous with salting their grasshopers, but neglect their cattle. This is a fact.

Locust fungus.—I am sorry to say that the tubes of the fungous locust disease left in my care, proved a complete failure. One failed to show any signs of growth, but

the others were perfectly fertile. The first culture was mixed in sugar and water and was left in a warm place, as directed, until it showed signs of growth, when it was put out as follows: (1) Scattered among the grass infested by locusts ; (2) locusts were caught and dipped in it ; (3) it was put on pieces of horse droppings, bran and other attractive food, the weather at the time being very dry. Locusts after being dipped in the culture were kept in a large box for some days, but showed no signs of being any the worse for their treatment. The second culture was put out on the evening of July 22, during damp and rainy weather, though rather cold. It was spread among the locusts in the same way as the first. Two locusts were found dead, possibly as a result of this, three days after it had been put out.

The third lot of fungus was put out on July 15, in the evening when considerable dew had fallen. No results were observed. Another lot was put out on the 16th. This was mixed in bread crumbs, some of which was eaten by locusts; but no dead insects were found. During the time several locusts were found which had been killed by the native fungous disease in spots widely removed from one another and at long distances from where the experiments were being conducted, showing that the weather conditions were at least fairly favourable for this work, and also that this disease is probably always present and makes its appearance as soon as the conditions are favourable. The last lot of fungus was put out on August 2 in the same way as the first.

No results were noticed.—NORMAN CRIDDLE.

Referring to the above statement that cattle have been poisoned by the Criddle mixture, it need hardly be pointed out that, with this remedy as with every other in which an active poison is used, at any rate ordinary and reasonable precautions must be taken to prevent stock of all kinds from eating the material. It is well known that horned stock will, if allowed to do so, eat the bedding from a horse stable, but this can hardly be recommended as a good food for the production of milk, and the practice should be prevented. If the Criddle mixture is distributed in the manner recommended, that is, for the material to be scattered loosely through the plants at the edge of a field of standing grain, it can hardly be said that there is any danger. One instance came to my knowledge of a man in Manitoba who had mixed half a barrel of the Criddle mixture, part of which he did not use. The half barrel containing this was put in his barn and left there till threshing time, when, to make room, it was turned out into his yard where he had some cows. Some of these ate the poisoned material and died from its effects, but this instance of carelessness can hardly be cited as a reason for not using this most useful remedy against grasshoppers. If it is, it means that the use of active poisons such as Paris green and many other compounds now thought to be necessary to the fruit-grower and farmer, and the whole operation of spraying, would have to be condemned. On occasions when farmers have been using the Criddle mixture, which is in every way the cheapest effective remedy for grasshoppers which I have ever tried, if there is any of the material left over, it should be scattered loosely over a piece of land where its fertilizing effects may be secured and where there will be no danger of poisoning animals.

The only other place in Canada where grasshoppers were noticed in numbers was in the Okanagan valley of British Columbia. Mr. E. P. Venables, of Vernon, writes : 'Grasshoppers were numerous at some places, and, although no appreciable damage was done, some people are anxious lest there may be a repetition of the plague of three years ago. Some of their enemies, however, were in evidence to an equal extent with the grasshoppers. Among these, the Spotted Gray Blister-beetle (*Epicauta maculata*, Say) was very abundant, feeding upon wild plants. Therefore, it is to be hoped that their larvæ will help, if they keep up their good name for destroying the eggs of grasshoppers.'

The Criddle mixture, as modified in accordance with the latest experiments, consists of one part of Paris green, mixed thoroughly in 100 of fresh horse droppings, to which two pounds of salt per half barrel of mixture have been added, after being dis-

solved in water. This is placed in a half barrel and drawn on a cart to the edge of an infested field or one likely to be infested. The mixture is then scattered broadcast along the edge of the crop by means of a trowel or wooden paddle. The locusts are attracted to it from long distances and are killed in large numbers by eating the poison.

FIELD CROPS.

The CLOVER SEED-MIDGE *(Cecidomyia leguminicola,* Lintner) has been the cause of very serious loss to seed growers in all parts of Ontario where clover seed is produced. Probably one-half of the crop was destroyed by this insect. In some districts the whole crop was completely ruined. The remedy of feeding off or mowing the first crop of clover before June 20 has been found satisfactory by all who have tried it. The reason of this is that the maggots of the first brood come to maturity towards the end of June, and then leave the clover heads to enter the ground, where they complete their changes; and if the clover is cut or fed off before that date, the immature larvæ are destroyed. If the clover is left standing later than June 20, the maggots will have time to complete their growth and leave the clover heads. From these larvæ the second brood which attacks the seed of the second crop is produced. Just about the time the seed is ripe, the larvæ of the second brood fall to the ground and burrow beneath the surface, where they pass the winter, the flies emerging in June of the following year and laying their eggs in the flower heads soon after these form.

The HOP APHIS *(Phorodon humuli,* Schrank).—It is many years since serious complaint has been received at the Division of excessive injury by the Hop Aphis. In the extensive hop fields of British Columbia there is an occasional outbreak, but the excellent crops of the last few years and the high price which has been secured for British Columbian hops, shows that this crop has been produced to great perfection and without serious injury from insects. In some of the plantations in the valley of the Fraser it has required constant attention on the part of growers to keep the 'Red Spider' under control; but this has been done to a reasonable extent. The sovereign remedy for all mites, of which the so-called Red Spider is one, is sulphur in some form, either as flowers of sulphur mixed in the ordinary quassia and tobacco wash, which is pretty generally used as a remedy or a preventive of Hop Aphis, or distributed as powder through the plants. A new pest which has appeared in sufficient numbers this year to be noticed in British Columbia is *Psylliodes punctulata,* Mels., a small flea-beetle which was sent in by Mr. H. Hulbert, of Sardis, B.C., under the name of the Hop Flea-beetle. This has been referred to briefly as a hop pest in Bulletin No. 4, old series, of the United States Division of Entomology.

Some years ago hops were grown to a large extent in Prince Edward County, Ontario; but of late years the industry has been to some measure given up for the cultivation of other crops. Some growers, however, have continued to grow hops, and quite recently others were resuming the practice. During the summer of 1903, which, as has been stated already, was particularly characterized by the abundance of many kinds of plant-lice, the hop yards of Ontario have suffered from a serious visitation of the old-time enemy, the Hop Aphis. Through the kindness of Mr. John D. Evans, of Trenton, I have received a great deal of information concerning this outbreak, and he has been good enough to visit and interview several of the growers who were most interested in this subject. I have also received from Mr. W. B. Cooper, of Bloomfield, Ont., who has been for many years an extensive grower of hops, a detailed account of this outbreak. Mr. Evans writes:

'Trenton, Nov. 23.—Mr. H. S. Miller, of Picton, who is a large dealer in hops, and who visited many of the hop yards at different times during the past season, states that the total hop crop in the district this year yielded only 46 tons; last year, with

the same acreage, it was 128 or 130 tons, and that at least two-thirds of the hop acreage this year was afflicted with the pest. Although the loss was severe in some places, it was not general throughout the district; for instance, Mr. Branscombe, of Chisholm, only got two bales from three acres, his crop being almost a total failure. He stated that the insects appeared first of all as plant-lice when the hops were coming into burr. After that it seemed as if a blight had struck them; the vines which were affected produced no hops, and the leaves turned black. On a knoll in his yard the vines were heavy and produced the two bales referred to. Then, on the other hand, Mr. Philip Vanmeer, of Bethel, Ont., had 22 acres of hops. The centre of his yard was on high ground, but the land sloped off in all directions to low ground. His yard was not affected, and he did nothing in the way of spraying or otherwise, in the way of special treatment, except that the yard was kept thoroughly cultivated. He had a very heavy crop. It would appear, then, that the abundance of this insect is not affected by the land being high or low. A great many ladybird beetles were present among the aphides. There was a similar visitation by the Hop Aphis in 1886, when the hop crop was almost ruined; but since that time the insect has occurred only in very limited numbers and has not been noticed. None, or very few, of the growers here have done any spraying, as they have not the special apparatus which is necessary. I am told that the spraying pumps which answer for fruit trees will not for hops.'

Mr. Henry Corby, of Belleville, Ont., as far as I can learn, was the only grower who sprayed his yards in a thorough way to protect them from injury by the Hop Aphis last year. His experience, however, has been so widely commented upon by hop growers in the vicinity and in Prince Edward county that I have no doubt the wise measures adopted by Mr. Corby will have the good effect of inducing others to spray their yards next year, should there be any appearance of the Hop Aphis. Mr. Corby writes:

'Belleville, Nov. 19.—Your favour in *re* Hop Plant-louse received. In reply we first noticed the Hop Plant-louse on the vines about the 1st July. From the 1st to the 10th they came on very thickly indeed. As I had eighty acres under cultivation, we continued the spraying for close on to a month. The mixture I used, was 7 pounds of whale-oil soap and 8 pounds of quassia chips, boiled for an hour. This made 100 gallons of wash. I used an English sprayer which takes two horses to draw it, but it does thorough work. I consider that I lost one-quarter of my crop at least; but, had I not used the sprayer, I doubt if I should have had any hops at all. The quality of my hops is first-class.'

The life history of the Hop Aphis is a remarkable one and is given in a condensed form in my annual report for 1889, which I repeat herewith, as the life history has an important application in this species, to the remedies which are suggested. The life history of the Hop Aphis has been carefully worked out by Prof. Riley and recorded in his report for 1888 as follows : 'Of this species the winter eggs are laid by the perfect females upon plum trees in autumn. From these hatch, the following spring, wingless females which are called "stem-mothers." These produce young plant-lice by a process analagous to budding in plants and known as parthenogenesis (from the Greek *parthenos*, a virgin, and *genesis*, production), which means the production of young from imperfect and unimpregnated females, without the intervention of a male. There are three broods of these parthenogenetic females produced on various kinds of plum trees, the third becoming winged. This last is known as a migrant and it instinctively flies to the hop plant, which up to this time has been free from attack. A number of generations of wingless females are produced upon the hop until, in autumn, winged females known as the return migrants again apear. These return to the plum and produce some three or more young which have no wings but are true sexual females. Somewhat later than this, upon the hop vines true winged males, the only males of the whole series, are developed. These fly to the plum trees and towards the end of the season may be found pairing with the wingless females, which afterwards stock the tree with eggs which pass the winter there.'

The above life history will show how complex and difficult to understand are the habits of some of our injurious insects. The importance of this knowledge, however, cannot be over-estimated ; for it is plain that, if the Hop Plant-louse passes the winter in the egg form upon plum trees, by having no plum trees near the hop yard, the opportunities for the insect to increase in a certain district are much reduced, and, further, that, if plum trees near hop yards are treated during the winter to destroy the eggs, a very large proportion of the infestation can be wiped out. It has frequently been noticed by farmers and others with what enormous rapidity the different kinds of plant-lice sometimes increase. Dr. Wm. Saunders, in the annual report of the Entomological Society of Ontario for 1878, refers to this matter as follows:—

'Some idea may be formed of the numbers to which in a short time plant-lice increase, from a calculation of Curtis, the celebrated English entomologist, who computed that from one egg only there would be produced in seven generations, taking thirty as the average of each brood, the enormous number of 729,000,000, so that, were they all permitted to live, everything on the face of the earth would in a short time be covered with them. Indeed, sometimes the possible rate of increase is even greater than this. Dr. Fitch, the state entomologist of New York, ascertained by actual experiment, that the wingless females of the Grain Aphis became mothers at three days old, and thereafter produced four young ones every day, so that even in the short space of twenty days the progeny of one specimen, if all were preserved from destruction, would number upwards of two millions.'

Some of the useful facts derived from a knowledge of the life history of the Hop Aphis, are that, as the eggs are laid upon plum trees and pass the winter there, it is important not to allow wild or useless cultivated plums to grow round hop yards ; but, if these trees are growing in the vicinity and it is impracticable to destroy them, the value of treating these before the eggs hatch, or just at the time the young plant-lice are hatching in May, with kerosene emulsion, or a whale-oil soap solution, is manifest. As the males are only produced at one season of the year and this on the hop plants after the females have migrated to plum trees, the utility is plainly shown of burning up at once after the crop is picked all the vines and leaves of the hop plants. In this way, it is believed that so many of the males will be destroyed that there will not be enough left to fertilize all the females which have flown away to the plum trees. Although plant-lice can produce young for a long time without the intervention of males, when the time comes for the perfectly sexed females to be produced, the males are necessary for the fertilization of the over-wintering eggs.

As there are three broods produced upon plum trees subsequent to the hatching of the eggs, it is not until comparatively late in the season that the plant lice appear upon the hop vines. It is an important observation then to know exactly at what date this migration from the plum trees to the hops takes place, because these insects are exceptionally prolific and multiply with enormous rapidity as soon as they reach the hops. Consequently the sooner the plants are sprayed to destroy the aphides the easier that work will be accomplished and naturally at a much smaller loss of vitality to the plants. In New York State the migration from the plum trees to the hops takes place in the month of May, so it is probable that this may also be expected about the end of that month, or early in June, in southern Ontario.

As to the best insecticide for controlling the Hop Aphis, there are several which may be used. Kerosene emulsion diluted to as weak a wash as one part to twenty-five of soft water, will kill the insects upon the foliage at the time they migrate to the hop plants. This strength will not injure the leaves, which it is stated is the case with stronger mixtures. To destroy the winter eggs on plum trees a much stronger mixture of the emulsion, viz., one to six, is necessary. Instead of the above, whale-oil soap, one pound to six gallons of water, may be used on the hop vines. The remedy, however, which is by far most generally used by hop growers in England, California and British Columbia, is the one which has been styled the 'English wash,' and is the stan-

dard remedy for the Hop Aphis in the hop gardens of the south of England. It is very similar to the one used by Mr. Corby, mentioned above :

100 gallons of soft water (if the water is hard add soda).

4 to 5 lbs. of soft soap.

6 to 8 lbs. of quassia chips, first steeped in cold water and afterwards boiled for one hour before mixing with the main supply of water.

The value of this wash has been clearly shown in England, where some hop-growers, as is the case with ourselves, do good careful work and get large and paying crops of hops of the first quality, while others who do not attend to these important matters get nothing at all or very little. The points most to be borne in mind by hop growers in this conection are,—that early work is less troublesome, less expensive, and pays enormously all trouble taken, therefore constant attention must be given to the yards at the time the insects migrate to them, and lastly, that one application of any remedy is not sufficient. The washes effective against plant lice, unlike the arsenical poisons which are placed on foliage and remain active for a long time until eaten by insects, are contact remedies only which, to be of any use, must actually be thrown on to each individual insect ; moreover, as the plant-lice do not all migrate to the hops at the same time, two or three applications at short intervals may be necessary. Throughout the summer the various broods of the hop aphis are wingless, therefore, if the first broods which appear on the hops are thoroughly dealt with, the yards can be kept clear for the rest of the season.

ROOTS AND VEGETABLES

Roots crops in all the eastern provinces of the Dominion have suffered from the unusual weather which prevailed generally last spring from the lakes to the Atlantic coast. The dry late spring prevented prompt germination of seed when sown early. Mangels were not up to average, from poor germination and the attacks of cutworms. Sugar beets, which are now being grown in many parts of Canada both for sugar and for stock, gave a fair crop. Turnips, where not injured by cutworms and the Turnip Aphis, gave good returns, particularly from late sowings put in after the June rains. Potatoes did not start well, owing to the drought of May and early June. The crop, however, was fairly good in size and quality, where not injured by the 'Potato Rot.' This disease, which can to such a large extent be prevented by spraying with Bordeaux mixture, as has frequently been pointed out in these reports, was, it is to be regretted, very destructive from the Maritime Provinces to the Prairies. The following extracts from Mr. B. W. Chipman's Nova Scotia government crop report for November last, are well worthy of consideration by the thousands of farmers and others who grow potatoes either in large or small quantities :—

'Chester.—The potato crop will be heavy and of large size, but the rot has begun in some places very badly. Early spraying with Bordeaux mixture has proved beyond doubt a preventive for blight rot, and should be thoroughly tested by all potato growers. The trial costs little and the result in this district has proved its value. Spray as soon as the plant is in blossom, and twice at intervals of two weeks later on, if the season is wet.'

'New Germany.—No potato bugs. Potatoes took blight about September 1, and in some cases 50 per cent are rotten. One man here, and only one, as far as I know, sprayed his potatoes, with the result that less than 1 per cent were rotten.'

The results of demonstration experiments which have been carried on at the Central Experimental Farm, Ottawa, year after year, for many years, have uniformly shown the enormous benefit of spraying potato vines about August 1, and twice afterwards at intervals of 15 days, with the Bordeaux mixture, which for this purpose con-

tains bluestone, 6 lbs.; unslaked lime, 4 lbs.; Paris green (to destroy leaf eating insects) 4 ozs., and soft water 40 gallons.

In the Ontario crop report for November last, Prof. James refers to the prevalence of the potato rot and estimates the loss at from 10 to 60 per cent in various localities. Mangels were in some places replaced by turnips, where the seeds had not germinated well, and turnips, although yielding a good crop, were in many quarters considerably injured by the Turnip Aphis.

The Colorado Potato Beetle was reported from all sections as being less abundant than for many years. The following reports are representative of many others received:—

‘Charlottetown, P.E.I.—Root crops were badly injured by cutworms, and many fields were resown for the third time; some land was ploughed up and sown to other crops. The yield of roots was fair on the decreased acreage; the cutworms seem to have been general over the whole province.’—E. J. McMillan.

‘Halifax, N.S.—Roots and vegetables good; potatoes above the average. No complaint of injurious insects on potatoes except the potato bug, and that was not as bad as usual. In some places, mangels, beans and vegetables were injured by cutworms. Turnips were somewhat attacked by aphis.’—B. W. Chipman.

There were not many large fields of roots this year in the province of Quebec. Many thought that it was too late after the rain came to bother with roots, so on the whole there will not be a very large crop. Some few have fair pieces.’—Peter Macfarlane.

Root Maggots.—Among vegetables, considerable injury has been done in nearly all parts of the Dominion by root maggots. The Cabbage or Radish Maggot, and the Onion Maggot, which for all practical purposes may be treated of as the same species, caused great loss in crops of cauliflowers, early cabbages, turnips, radishes and onions. The occurrence, however, was irregular, much harm being done in spots, while in another not very far distant there was no appearance of the attack. There is nothing new so far in the shape of a remedy for these insects when large areas have to be treated; but some experiments which have been carried on by the Horticulturist at the Central Experimental Farm during the past summer with the object of producing early tobacco and vegetables of high quality, have an important entomological bearing which is well worthy of mention. An enclosure was made of a light framework of wood, six feet in height, and covered entirely on the top and along the sides with cheese cloth. In this tent tobacco and various kinds of vegetables were sown, or planted, and a similar duplicate plot was also planted just outside with the same conditions of soil and soil moisture. The rows of this plot were practically in continuation of those inside the enclosure. This experiment was satisfactory, both as to forcing the plants forward to earlier maturity, and on account of the important discovery made by Mr. Macoun that this cheap protection prevented entirely the attacks of many kinds of injurious insects. Radishes, onions, cabbages and cauliflowers developed well and were absolutely free from root maggots. Nothing was attacked by the troublesome Tarnished Plant Bug (*Lygus pratensis*, L.) or the Four-lined Leaf Bug (*Pœcilocapsus lineatus*, Fab.). Cucurbits of all kinds were entirely free from injury by the Striped Cucumber Beetle. In fact, this experiment has furnished us with a sure means of growing many vegetables of which, from the difficulty of getting them into perfect condition, gardeners had in some places given up the cultivation. This is particularly the case with cauliflowers, early cabbage, radishes, onions

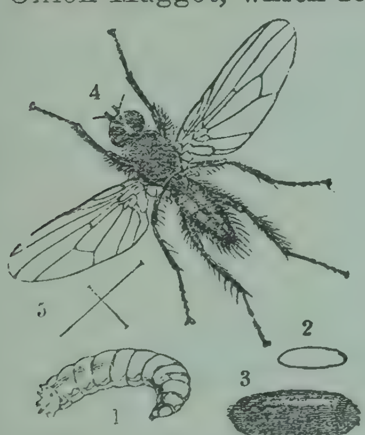

Fig. 6.—Cabbage Maggot: 1-3, maggot and pupa case; 4, fly—1, 3 and 4 enlarged.

and other plants of only moderate height. These could be entirely protected by a framework which any ordinary workman could make, only three feet high and three feet wide for single rows in a garden. With such a covering, it would be impossible to cultivate between the rows; but, if made in sections, these could be removed for that purpose when necessary. The cost of building an inclosure in which a man could work with ease and where several hundreds of plants could be grown, would be little compared with the increased price which would be obtainable for the earlier and much superior crop. Careful handling in taking down and storing away the cheese cloth and framework would insure the lasting of these for at least two or three years. These inclosures are manifestly better suited for the cultivation of some plants than for others; such plants as egg plants and cucurbits, which depend on the intervention of insects for the fertilization of their flowers, would require to be fertilized by hand if grown in these inclosures. A noteworthy result of these experiments was that the vegetables grown within the inclosure were entirely free from attacks of root maggots, while those grown in the corresponding plot outside were badly affected.

Remedies for root maggots are frequently asked for, and those which have been recommended in the past are as follows : For early cabbage and cauliflowers, the best remedy is undoubtedly an early application of the disks of tarred paper recommended by Prof. Slingerland. We use these regularly at the Central Experimental Farm, and always with great satisfaction. Where these have not been put on early, a remedy which may be used is to pour about half a teacupful of a strong decoction of pyrethrum insect powder, four ounces to the gallon of water, around the roots of each plant, after drawing away the earth right down to the rootlets. The earth must then be pushed back again. For onions and radishes, dusting white hellebore along the rows as soon as the young plants appear, has given good results in seasons when the flies are not abnormally abundant. Kerosene emulsion and a solution of whale-oil soap have also been used by some. Another excellent remedy is the carbolic wash recommended by Prof. A. J. Cook many years ago. This consists of boiling up one quart of soft soap or one pound of hard soap in a gallon of water. When boiling, add half a pint of crude carbolic acid. Boil for a few minutes and stir thoroughly. The mixture is then ready to be stored away for future use. When required, take one part of this mixture by measure to fifty of water, and sprinkle or spray directly upon the growing plants once a week from the time they appear above the ground.

The CABBAGE AND TURNIP APHIS *(Aphis brassicæ, L.)*.—Although not so injurious as it has been in some previous years, this insect was the cause of considerable loss in British Columbia, Ontario, Nova Scotia and Prince Edward Island. The worst attacks were probably in Prince Edward Island and Nova Scotia, whence frequent requests for information came. The injuries were to both cabbages and turnips. When cabbages in gardens are attacked, the insect should be looked for when the plants are being cultivated, and, as soon as the first colonies appear, which will probably be late in July or in August, they should be attended to at once, before they increase in numbers. Whale-oil soap, one pound in six gallons of water, or the ordinary 1 to 9 dilution of kerosene emulsion, if sprayed thoroughly, will destroy the aphis. In turnip fields, where by far the greatest amount of injury is done, those engaged in thinning and hoeing should be constantly on the watch for infested plants, which may at that time be hoed out and destroyed. This will, in many instances, be sufficient to prevent the occurrence later of a serious outbreak. The eggs of this insect are laid on the turnip tops late in autumn. This suggests the

Fig. 7.—The Cabbage Aphis : 1 and 2, male; 3 and 4, wingless female—2 and 4 enlarged.

advisability of ploughing down deeply all tops which are cut from the roots at the time of harvesting in autumn, so as to destroy the eggs. In fields of cabbages, where also eggs are laid, the same practice should prevail when the cabbages cannot be fed or are too poor to store for feed purposes. The leaving of poor or imperfectly developed crops in the field until the following spring is always a dangerous practice from the point of view of those who study insect attacks. Not only may the crop have been reduced to its worthless condition by the attacks of insects which will pass the winter safely among the plants; but, even on well developed plants, there are always certain natural enemies the presence of which is detrimental to the farmer and gardener. Whenever possible, all haulms, vines, stems and foliage should be fed to stock; but, in the few cases where these are useless, they should be ploughed down into the soil to decay or be burnt, and, when this can be done in autumn, it is far better than waiting till the following spring. Many insects and fungous diseases are thus destroyed or placed where they can do no harm, and much time is saved in spring in having the land in a condition to start work at once.

CUTWORMS.—These troublesome caterpillars have, as is usually the case, been more or less destructive to field and garden crops everywhere; but in Nova Scotia and Prince Edward Island almost every report mentions their depredations, and the official crop reports from these provinces show that considerable harm was done in almost every county. Such specimens as were received at the Division were the Red-backed Cutworm *(Paragrotis ochrogaster,* Gn.). The same species was the one responsible for most of the harm done in Quebec, Ontario and Manitoba. In Ontario it was accompanied by the Dark-sided Cutworm *(Paragrotis messoria,* Harr.), which was enormously abundant in some places at Ottawa. Here also in restricted localities the so-called Climbing Cutworm *(Paragrotis scandens,* Riley) was troublesome in sandy fields. At Regina and Calgary, N.W.T., the species which did harm in gardens was *Chorizagrotis auxiliaris,* Grt., the large caterpillars of which resemble the Red-backed Cutworm in a general way, and are equally omnivorous, destroying all kinds of succulent plants. The moths of *C. auxiliaris,* Grt., as well as of the allied *C. introferens,* Grt., and *C. agrestis,* Grt., both of which, possibly, are only varieties of *C. auxiliaris,* Grt., have been taken in large numbers at Millarville, 20 miles south of Calgary, by Mr. F. H. Wolley-Dod, and by Mr. T. N. Willing, at various places north and south of Regina. In Vancouver Island the species which was most troublesome proved to be *Paragrotis perexcellens,* Grt., which was very much commoner than it had been for some years. In 1885 it was a perfect plague in market gardens around Victoria, and in 1888 specimens were also sent to me, which were at that time incorrectly identified and mentioned in my report for 1888 as an allied species, under the name of *Agrotis obeliscoides,* Gn.

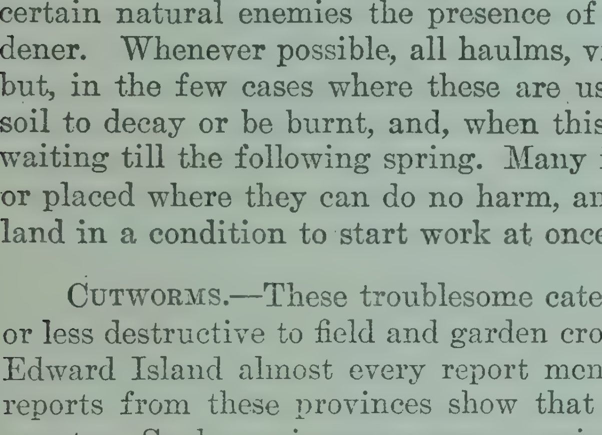

Fig. 8.—The Climbing Cutworm : moth and caterpillar.

All of the species mentioned above have the same feeding habits and would be controlled by the same measures, which are: The removal from gardens or fields, as early as possible in the autumn after crops are reaped of all refuse, and the cultivation of the land so as to prevent the deposition of eggs. This takes place during August and September, and some of the eggs, if not all of them, remain unhatched until the following spring; therefore, late fall ploughing, or early spring ploughing, by which the eggs were buried deeply would be beneficial. When in large numbers, these caterpillars, like most other cutworms, wander long distances at night in search of food. Therefore, it is necessary to make some direct application

to destroy them. For this purpose, the best remedy in my experience is the poisoned bran mash, which is remarkably efficacious. In making this material, which is equally useful in field practice as in gardens, it is best to dampen some of the bran slightly with water containing a little sugar. After mixing thoroughly, add the Paris green little by little, stirring all the time. If Paris green is added to the bran when it is perfectly dry, it will, owing to its weight, sink at once to the bottom when stirred. Half a pound of Paris green is sufficient to poison 50 lbs. of bran, although double this amount may be used. Bran should be added to the mixture until it will crumble easily and run through the fingers without adhering. It may then be distributed through or along the edge of an infested crop or may be applied to land either around or between plants, or a row may be run close to drills by means of a Planet Jr. seeder, or a similar implement. For such crops as tomatoes, cabbages, tobacco, &c., a collar of paper put around the stem at the time of planting, will prevent the destruction of many plants. Seedlings must be planted so that none of the leaves hang down and touch the ground. The same protection is provided in a more permanent manner, but at greater cost, with strips of tin. Convenient rings may be made from old tomato and fruit cans by throwing these into a bonfire and melting off the tops and bottoms and then splitting the sheet of tin which is left down the centre. This not only makes a good protection against cutworms, but disposes of a class of rubbish which often accumulates to an inconvenient degree.

The SUGAR-BEET WEBWORM *(Loxostege sticticalis, L.)*.—When in Manitoba last July, my attention was drawn by Mr. Hugh McKellar to reports which appeared in the newspapers of swarms of a small blackish caterpillar which had appeared at Brandon and other points east and west of that city, and which after devouring its natural food plants, had wandered in armies to new fields in search of food. The first notice of this insect in 1903, came to me from Mr. J. R. McMullen, of Melita, Man., who stated that two years before this he had noticed enormous numbers of small moths among his wheat in the month of June. He writes on June 15, in a letter addressed to the Department of Agriculture for Manitoba, which was referred to me, an interesting account of an excessive occurrence of the caterpillars during 1902, as follows: 'I thought no more of these moths until last summer. I had ploughed a field of stubble in June and sowed it in Brome grass, of which I got a good catch. There was a lot of pigweed in it, and, when the weeds were about four or five inches high, I was surprised to see thousands, yes millions of worms, eating up the pigweed, making a complete job and killing it entirely. On thirty acres they ate every pigweed, but very little of the grass or any other plants. They started to work on the north side of the field and travelled south. Nothing would turn them. When they came to the tub where the horses are watered, they crawled up the sides and fell into the water by thousands; even when they came to the house, they crawled up the walls and clean over the house. These caterpillars were from three-quarters of an inch to an inch long, greenish in colour and with yellow stripes down the back and sides for the full length of their bodies. On the back the stripes were widened out or dotted in ten or a dozen places. When they reached the garden, they ate nothing except beets, although they tasted some other vegetables but did not eat much of them. They came to a big field of wheat just headed out, but did it no harm. In four or five days they were all

Fig. 9.—The Sugar-beet Webworm: *a*, moth; *b*, caterpillar; *c*, *d*, segment of *b*—all enlarged.
(Chittenden, U. S. Dept. of Agriculture.)

gone. I did not notice any of the moths last year, but now (June 15), the moths are thick, and I send you a few to examine. I should like to know what these are, although they did me no harm last year; in fact, they saved me a day or two's work cutting weeds, but I might not have a field of pigweed ready for them when they come again.'

The Sugar-beet Webworm can hardly be described as a green caterpillar, because it is dark black, with greenish yellow stripes, but, strange to say, almost every correspondent who mentioned it referred to it as a green caterpillar. As, however, in most instances specimens of the caterpillars accompanied the inquiries, there was no doubt as to the identity of the species, which has been kindly supplied to me by Dr. Dyar, of the Division of Entomology, at Washington. It would appear from the dates when caterpillars are mentioned by observers in Manitoba, that there were two broods of this insect last summer. The life history of the species has been carefully worked out by the Division of Entomology at Washington, and illustrated articles have appeared upon it in 'Insect Life,' V. and VI., and in the recent Bulletin 43, by Mr. F. H. Chittenden, on the 'Principal Insect Enemies of the Sugar-beet.' The excellent illustrations given herewith have been kindly lent to me by Dr. Howard and were used in the last named bulletin.

The following letter gives some idea of the range of plants liable to be attacked by these caterpillars. There is no doubt that the normal food plant is the Lamb's-quarters or Wild Spinach *(Chenopodium album,* L.), often called pigweed.

'Deleau, Man., July 21.—We have had a visitation from a pest that I have never seen before in my 21 years' residence here. About two weeks ago we noticed the pigweed on land left for summer-fallowing covered with a greenish worm, samples of which I send you. In a day or two these swarmed into the garden in millions. They scarcely touched potatoes, beans or corn, but devoured turnips, beets, cabbages, onions, carrots, currant bushes, and even crap-apple leaves. We made a vigorous fight to save something, making narrow trenches for them to fall into, and tried various poisons, but without avail; so, we stuck systematically to knocking them into tin pans and emptying these into pails of water with coal oil in them. In this way we caught several pailfuls in a day. They have now almost disappeared but have left the garden in a very dilapidated condition. As soon as we noticed them coming off summer-fallow, we ploughed the land next to our garden, but they swarmed over on top of the ploughing. They seem to be good travellers. I should like to know what they are.' —J. E. MARPLES.

Specimens of the caterpillars were sent, without any letter being received, from Mr. H. L. Patmore, of Brandon.

Mr. Norman Criddle, of Aweme, sends the following notes :

'Sept. 5.—Do you remember mentioning when here a small prairie moth, which one of your correspondents was afraid of as a possible enemy of wheat. I am sending you now what I am pretty sure are the larvæ of the moths you showed me. These caterpillars are here now simply in enormous numbers, more so than anything of the sort I have ever seen. They clear off all the food before them and then march on in a regular swarm, all going the same way. The food plant seems to be usually lamb's-quarters, but this has been all eaten clean, and they are now turning their attention to wild buckwheat, the native asters, the tumble-weed *(Amarantus),* sand cherry, red cherry, rose, red-root pigweed, and even wheat and oats, as well as numerous other plants. Fortunately, they are too late in the season to do much harm, and in any case they seem to prefer weeds to grain. The moths were very abundant during June and July.'

'Sept. 27.—The larvæ have now all disappeared beneath the ground, but whether to hibernate or pupate, I am not quite sure. Several that I dug out had not yet undergone any change, but had merely made a straight burrow about two inches deep, which

they had lined somewhat loosely with web. In reply to your letter, the food preferred to all others is lamb's-quarters, and wheat was only attacked when all other plants had been eaten. So far, instead of this insect being an enemy, the caterpillars have proved undoubted friends.'

'Oct. 18.—I went out this morning to try and find out for you whether the larvæ of *Loxostege sticticalis*, L., had turned to pupæ or not. I found they were all hibernating as larvæ, as you suspected. They are from one to two inches beneath the ground in a closely woven chamber of web, and they are now very sluggish.'

The Sugar-beet Webworm is stated by Mr. Chittenden in his bulletin, to be an introduced insect from western and central Europe and northern Asia, which is evidently slowly but steadily pushing its way eastward. From the letters given above, it is quite apparent that the outbreak of last summer was exceptional, and also that the favourite food plant is the well known and troublesome weed of western wheat fields, the lamb's-quarters, and allied plants. As, however, the sugar-beet is one of these and great efforts are being made in the West to foster the cultivation of this crop, it seems important to make the appearance and habits of this insect well known. The most important points with regard to these are as follows : The pale yellow eggs are laid singly or in rows of two to five, overlapping like fish scales. The young larvæ are at first whitish, with polished black heads and bristle-bearing spots. They soon become blackish caterpillars with thin skins, through which the green contents of the body show. These are very voracious and very soon strip plants of their leaves. The caterpillars appear in July and early September. Pupation takes place in the ground, not deeper than two inches beneath the surface, consequently they can be reached and disturbed by the teeth of an ordinary cultivator at the time they are in the delicate chrysalis condition. Actual experiments are reported by Dr. Howard (Insect Life, VI., p. 37) to have been successful with the winter brood. It would doubtless be so with the summer brood. Prompt attention in spraying an infested crop with arsenical poisons will certainly control this insect should it ever become troublesome in crops of sugar beets. Such plants as spinach in gardens could not, of course, be treated with poison. In those cases, mechanical means of prevention as ditching, might be tried.

FRUIT CROPS.

A satisfactory feature of the year 1903, like that of the previous year, has been a marked decrease in the injuries caused by some of the well known pests of the fruit-grower. The Tent Caterpillars, Cankerworms, Squash Bugs, and even the Codling Moth, in most places may be said to have done hardly any harm. Fruit crops have been exceptionally remunerative. The apple crop in Nova Scotia was a remarkably good one, large in quantity and excellent in quality, being very free from insect attacks as well as from Black Spot and other fungous diseases. (B. W. Chipman.) In Prince Edward Island the crop was 'rather poor, having been injured by the late frosts and dry weather in spring.' (E. J. McMillan.) Through Quebec and Ontario the crop on the trees was not so large as in some previous years, but the quality was so exceptionally good that there was a larger quantity of A 1 fruit for export than has been the case for several years. Only in the west of Ontario was any trouble experienced with Black Spot fungus, or insect enemies. In British Columbia apple crops were somewhat reduced by the attacks of the Apple Aphis, but the output was large and of excellent quality. The poor crop of apples in England last season gave Canadian growers a good opportunity of showing to what exceptional excellence this valuable fruit can be grown in this country, and the large quantity shipped up to the end of November, over 1,000,000 barrels, with a probable total export of 2,000,000 by the

end of the season, as well as the high quality of the fruit, will no doubt make a lasting impression on the British market.*

'There was a fair yield of apples; but in various parts of the province of Ontario complaints were made of the scarcity of barrels, and, on this account, buyers were more particular than ever in the selection of this fruit ; thousands of bushels of apples that in former years would have passed for shipment to Great Britain, were this season rejected by them.'—(C. C. James).

Not only was the quality of the fruit exported this year better for the above reason, but the rigorous application of the 'Fruit Marks Act' has prevented much second-rate fruit from going forward, which otherwise would have found its way to the British markets. This will be a decided and lasting benefit to the country. Grapes were a good crop in the Niagara peninsula, but in Essex and Kent the crop was practically destroyed by the Black Rot of the Grape *(Lœstadia Bidwelli,* V. & R.) Plums were an enormous crop in almost all parts of the Dominion, injuries by the Plum Curculio being considered this year rather a benefit than otherwise for the work they did in thinning fruit on the overloaded trees. The only discounted reports as to plums were from some parts of the maritime provinces. In British Columbia considerable loss occurred from the attacks of the fungous disease known as Brown Rot or Ripe Rot (*Monilia fructigena*), which attacks the fruit just when it is ready for the market. This loss was chiefly on Vancouver Island and near the coast on the mainland. Orchards which had been sprayed early in spring and where the diseased plums had been carefully gathered and destroyed, were noticeably freer from attack than where no remedial measures had been adopted. The Shot-hole Fungus (*Cylindrosporium padi*) also did considerable injury by defoliating the trees before the fruit was ripe. This, like the last named disease, can be controlled by regular spraying. Peaches were an enormous crop of excellent quality. Cherries were fair on Prince Edward Island, good in New Brunswick and Nova Scotia, excellent and abundant in Quebec, Ontario and British Columbia. The pear crop is reported as good ; but the ravages of the Pear-tree Slug were serious in some places, and the Pear-tree Flea-louse is reported by Prof. Lochhead as having been very injurious in the Grimsby district of Ontario. On the fruit farm of Mr. W. R. Dewar, trees were much stunted and were covered with the dirty black fungus, *Fumago salicina,* which develops upon the honey-dew emitted by this insect and various other kinds of plant-lice. Berries and small fruits generally were seriously affected by the drought of early summer through the region where this prevailed. The rains, which came about the middle of June, were too late to save the strawberry crop but helped considerably raspberries and currants. Cranberries in Nova Scotia did not produce such a paying crop as usual, but this was not due to any trouble with insect enemies. In Prince Edward Island this crop was reported as 'fair.'

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* The following extract from the 'Glasgow Herald' of January 5, 1904, in an article upon the Fruit Imports into the United Kingdom in 1903 is significent : 'Green Fruit Import. The apple trade was unique, 1903 being a bumper year. The total weight was 4,550,000 cwt. valued at £2,850,000. In ten years the imports have been nearly doubled ; 1903 even surpassed 1896, which was the most prolific season of recent years. The imports in favour of 1903 against 1896 are 3,000,000 bushels. We get the largest parcels from the United States and Canada. These countries send us more than 2,500,000 cwt. annually. Of course, the Canadian apples are much superior to those of the United States.

OYSTER-SHELL BARK-LOUSE *(Mytilaspis ulmi,* L=*M. pomorum,* Bouché) has been complained of from almost every part of the Dominion where fruit trees are grown; and the chief reason that it remains unchecked and continues to increase, seems to be that it is so often overlooked by fruit growers and others who ought to know such a common and destructive enemy by sight and also be well acquainted with the best means of fighting against it. In south-western Ontario excellent work has been done in preventing the spread of this scale by the minute chalcid parasite, *Aphelinus mytilaspidis,* LeBaron. The presence of the parasite in a district can be detected by the minute round holes left by the tiny parasites where they have eaten their way out through the tops of the old scales. This minute friend is so small that it can hardly be seen with the unaided eye. It is bright yellow in colour, with golden eyes, and measures only about one thirty-sixth of an inch in length. Under a magnifying glass, it is found to be a four-winged fly shaped as shown in the enlarged figure herewith. This parasite is sometimes so abundant that it destroys more than half of the scales which are formed. It has occurred in all parts of Canada but never seems to remain long in any district, a fact which is rather remarkable, as the Oyster-shell Bark-louse upon which it feeds is abundant everywhere. For the last year or two it has been noticed in large numbers upon scale-infested fruit trees in the Niagara district. There is only one brood of the Oyster-shell Bark-louse in the year. The young bark-lice emerge from beneath the old scale in Ontario and British Columbia about the end of May, and in the maritime provinces towards the end of June. At that time they are small six-legged insects resembling mites. After emerging, they wander about the trees for a few hours, looking for a suitable place to attach themselves to the bark, which they do by means of their slender beaks. Once having attached themselves, they never move from that place ; gradually their legs disappear, with the increase in size of their bodies, and a waxy scale is secreted over them. By the middle of August the female bark-louse has practically changed into a bag of eggs protected by a scale. Little by little the body of the mother insect dries up ; and, when all of her eggs are laid, the scale is well filled with these minute white objects, and the mother's body is merely an empty skin at the small end of the scale. The scales of the male bark-lice are seldom noticed. They are of different shape and, as a rule, occur on the leaves. They are much smaller than those of the female and are long, narrow and white. (Fig. 12*c*.) The perfect male is a tiny winged insect which is able to fly well.

Fig. 10.–Twig infested with Oyster-shell Bark-louse.

Fig. 11.—*Aphelinus mytilaspidis.*

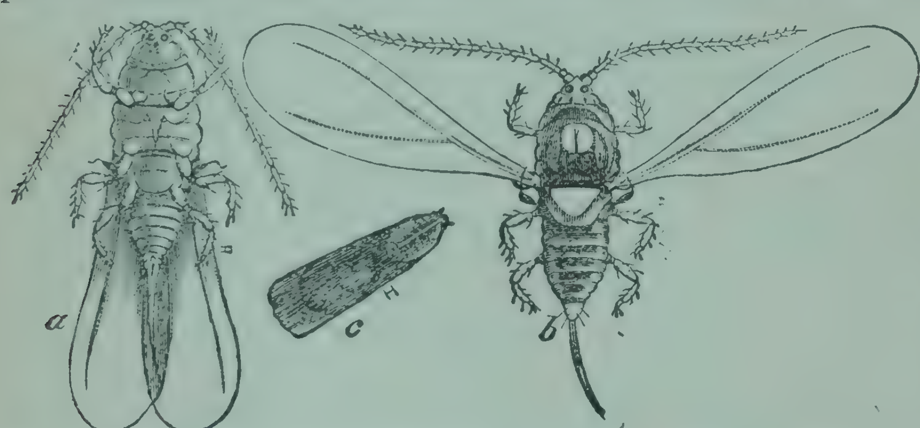

Fig. 12.—The Oyster-shell Bark-louse: *a, b,* male adult ; *c,* male scale—much enlarged.

Trees upon which this insect occurs, are weakened by being robbed of their sap by these small insects, which frequently occur in such enormous numbers as

almost to coat the trees and entirely hide the bark. Although so destructive in all parts of Canada, the Oyster-shell Bark-louse is not a particularly hard insect to control, where trees are attended to regularly. The first step to take when an orchard is found to be attacked is to invigorate the trees by ploughing round them and feeding them with some quick-acting fertilizer, such as well rotted manure, or a dressing of wood ashes. When trees have been standing in sod, it is well to break this up. Trees which are planted too closely, should be pruned and cleaned out, so that they may be easy of access for spraying and other operations. As soon as winter has set in, the trees should be sprayed thoroughly with a thin lime wash, one pound of lime in each gallon of water. Two coats must be applied, the second immediately after the first is dry. Where the lime-sulphur-and-salt wash is used to protect trees against fungus and insect enemies, there will never be any trouble with the Oyster-shell Bark-louse. The young bark-lice emerge from their mothers' scales during June ; the exact date should be watched for, and, immediately the dust-like yellow mites are noticed, the trees should be sprayed without delay with weak kerosene emulsion, or a whale-oil soap solution, using one pound to six gallons of water.

The SCURFY BARK-LOUSE (*Chionaspis furfura,* Fitch.)—In western Ontario this bark-louse has become so abundant recently, that many fruit growers are noticing it. In several cases, it has been mistaken for the San José scale and has been sent in for that insect. It is only occasionally that this scale develops in sufficient numbers to injure trees seriously. When it does so, it can be treated in the same way as the Oyster-shell Bark-louse. Mr. W. W. Hilborn found it was entirely destroyed by the lime-sulphur-and-salt wash. The eggs of the Scurfy Bark-louse are bright red in colour and are to be found beneath the scales by the middle of August or early in September. The male scale, as in the case of the Oyster-shell Bark-louse, is of quite a different shape from that of the female. In both sexes the scales are white and so closely appressed to the bark that they are easily overlooked or are not recognized as scale insects. The male scales are frequently found all clustered together in groups around the base of a twig or at some inequality of the bark.

The EYE-SPOTTED BUD-MOTH *(Tmetocera ocellana,* Schiff).—The insect concerning which most inquiry was received from Nova Scotia last spring, was the Eye-spotted Bud-moth. Attention had already been called to it by its frequency in Nova Scotian orchards during the previous year, and specimens also came in from some parts of Ontario and Quebec and from one point in British Columbia. Prof. F. C. Sears, Director of the Nova Scotia School of Horticulture, of Wolfville, N.S., writes at the end of the season: 'Even the Bud-moth, which for the past few seasons has been extremely abundant, proved much less troublesome than was anticipated. This was undoubtedly due in large measure to the fact that our orchardists now understand it better and apply the early spraying, by which it is best controlled. We find that this early spraying should be applied from May 1st to 10th, according to the season. I am glad to report that spraying was much more general during the past season than ever before, particularly in Annapolis County. One dealer there sold one hundred spraying outfits ; but, as the season was particularly unfavourable for fungous pests and most insects, I fear that some that sprayed for the first time may be discouraged.' It was suggested by Mr. E. E. Archibald, of Wolfville, N.S., that the irregularity in the fruit crop in the celebrated Annapolis valley of Nova Scotia might be due to the depredations of this small but very destructive and frequently unrecognized enemy. I believe that his suggestion was in a large measure correct and, where correspondents had reported a blighting of the leaves and fruit buds, I am sure these results had been in many cases directly due to the attacks of the caterpillars of the Eye-spotted Bud-moth. On account of its abundance last year, it will be wise for fruit growers to examine their trees during the present winter and early next spring, to see if there are any of the

small brown caterpillars upon them, and, should they find any, to be prepared to spray their orchards thoroughly, just at the time the buds are bursting, with a poisoned Bordeaux mixture, this being the remedy,—of many which have been tried,—which has given the best results. This mixture, made according to the formula which we use at the Experimental Farm, is as follows:—

Copper sulphate (bluestone)..........................	4 lbs.
Unslaked lime....................................	4 lbs.
Paris green (for Bud-moth and other leaf-eating insects)..	8 oz.
Water (one barrel)...............................	40 gals.

Dissolve the copper sulphate by suspending it inside a cotton bag in a wooden or earthen vessel containing five or more gallons of water. Slake the lime in another vessel, and then strain the lime wash through coarse sacking or a fine sieve. Pour the copper sulphate solution into a barrel, or it may be dissolved in this in the first place, and fill the barrel with water. Stir thoroughly before using. A stock solution of copper sulphate, and lime wash may be prepared and kept in separate covered barrels through the spraying season; but the quantities of copper sulphate and lime in the solutions should be carefully noted, so that the proper strength may be used when a wash is required for spraying.

The caterpillars of the Eye-spotted Bud-moth pass the winter on the twigs of trees, upon the foliage of which the eggs had been laid the previous summer. Each caterpillar is snugly curled up inside a small silken tent or covering called a pseudo-cocoon. These are extremely difficult to find until their appearance is known. They are located, as a rule, right in the crotch between two twigs, or in any small depression on a fruit spur. In many instances, I have found that a small piece of leaf or of lichen, is attached to the outside. On opening these with the tip of a knife, the small brown black-headed caterpillar, one-eighth of an inch in length, will be found inside. These caterpillars when they go into winter quarters are less than half-grown, having passed through three or four of their six moults. Early in spring, just before the time that the leaf buds burst, they emerge from their shelters and attack the opening leaf and flower buds. They do a great deal of harm at this time because they not only devour the young leaves but a single caterpillar will destroy a whole cluster of flowers. Their injuries are severe, both upon young trees and also upon full-grown bearing trees, which in some instances have been stripped of almost every bunch of flowers. These caterpillars become full-grown during June and then spin cocoons among the dead leaves which they have injured. The small gray and white moths appear during the month of July. These moths are similar in shape and size to the Codling Moth but are of a general dark gray colour, blotched with white, which makes them very inconspicuous when they are at rest on the trunks of trees. They measure about three-fifths of an inch across the opened wings and may be recognized by an eye-like spot upon each of the fore wings. The moths appear from June to the middle of July; they rest on the trees during the day time but are very active at night, flying about fruit trees and laying their eggs upon the leaves. The eggs are remarkable little objects which lie very flat upon the leaf on which they are deposited. Under a magnifying glass, they have more the appearance of minute drops of water, or of tiny fishes' scales than of the eggs of an insect. Ten days after the eggs are laid, the young caterpillars hatch, and their habits during the summer are quite different from those of the spring. As soon as the caterpillars hatch, they crawl to the middle of the lower side of the leaf and form a silken tube close to the midrib of one of the larger veins. Here they feed upon the tissues of the lower side of the leaf, leaving the network of veins and the upper surface of the leaf. As they extend their operations, they cover themselves with a light tent of silk. They grow slowly, remaining for eight or ten weeks on the same leaf where they were born; they then stop feeding and crawl from the leaves to a con-

venient place on the twigs, where they spin their winter coverings. This generally takes place, Professor Slingerland found, in the first half of September, and is done irrespective of the weather, even if it be fine and hot, and there is abundance of food. Like all other insects, they seem to know instinctively that it is the proper time for them to prepare for winter. The spring appearance of the caterpillars, on the other hand, is much less regular as to date and will vary as much as three or four weeks, according as the spring and the time of the opening of the buds is early or late. However, it may be generally stated that the caterpillars leave their winter quarters and begin their depredations at the time the leaf buds open. There is only one brood of this insect in the year, the caterpillars which attack the leaves in the late summer, being the same ones which destroy the leaf buds the following spring. The moths appear at only one period in the year, viz., during the three or four weeks from the middle of June till the middle of July. Since the life-history of this insect has been discovered, better remedial measures have been devised than were previously known. The fact that the caterpillar passes the winter half-grown, accounts for the large amount of injury which is done so soon after growth begins in spring. The Eye-spotted Bud-moth attacks, besides the apple, the plum, the peach, the pear, the quince and the blackberry.

The remedy which, as stated above, has given the best results, is to spray the trees thoroughly with a Bordeaux and Paris green mixture at the time the buds are opening, covering the whole tree so that every bud may receive its share of poison. The Bordeaux mixture will also, when applied at that time, materially hold in check the troublesome Black Spot disease of the apple. There are, of course, many other kinds of poisons which may be used ; but those which have given the best results, are Paris green, Arsenate of Lead or Disparene, and Green and Pink Arsenoid. Where great care is exercised in mixing and making the application according to instructions and also in destroying carefully all surplus left on hand after spraying, white arsenic in any of its combinations may be used and will destroy all leaf-eating insects, upon trees which have been sprayed with a mixture containing it ; but its use is attended with considerable danger to foliage and also with great risk to animal life, including human beings, from having about a house or outbuilding a substance which so closely resembles so many materials used in a household. In Prof. Bailey's most useful little Horticulturists' Rule Book, under the head of arsenic, we find the following:—'Arsenic.—Known to chemists as arsenious acid or white oxide of arsenic. It is considered an unsafe insecticide, as its colour allows it to be mistaken for other substances; but in its various compounds it forms one of our best insectides. From one to two grains, or less, usually prove fatal to an adult; 30 grains will usually kill a horse, ten grains a cow, and one grain, or less, is usually fatal to a dog. In cases of poisoning, while awaiting a physician, give emetics ; and, after free vomiting, milk and eggs. Sugar and magnesia in milk is useful. In the very complete experiments which have been recently carried out under the instructions of Dr. L. O. Howard, the United States Entomologist, by Mr. C. B. Simpson, on the Codling Moth, the following important statement is made as to the insecticide which he found most useful in his extensive investigations:—

'Arsenite of Lime with Soda.

White arsenic..........................	pound 1
Sal soda (crystal)......................	pounds 4
Water...................................	gallon 1

'The ingredients are boiled in the required amount of water until dissolved, which will take place in a comparatively few minutes, after which the water lost by evaporation is replaced. To every 40 or 50 gallons of water a pint of this stock solution and from 2 to 4 pounds of fresh slaked lime are added. The chemical com-

pound derived from the combination of the sal soda and the white arsenic is arsenite of soda. In the presence of lime this breaks down and arsenite of lime is formed. It requires 4·4 pounds of crystal sal soda, or 1·6 pounds of dry sal soda to combine with one pound of arsenic, and 2 pounds of freshly slaked lime to combine with one pound of arsenic to form arsenite of lime. It is always desirable to have an excess of lime present, in order to prevent all danger of burning; furthermore this excess is a convenience to fruit growers, because they can see by the distribution and amount of lime on the foliage how well the spraying has been done. The formula, which is the Kedzie formula with a few minor changes, has been used in many different sections of the country with unvarying success. In all of the practical tests under the advice of the writer, this solution is used and is found to be, not only as efficient as other solutions, but far cheaper.'

'When it is desired to use Bordeaux mixture with this solution, it is added to the Bordeaux mixture in the same proportion as to a similar quantity of water.'

The above quotation is given here because I am aware that many fruit growers in different parts of Canada are using white arsenic in some form for spraying fruit trees in preference to Paris green, and moreover because considerable injury has followed this practice, which has to a certain measure served to discredit the most important practice of spraying fruit trees for the prevention of injury by leaf-eating insects. In my own experience, I prefer to use Paris green, knowing it to be perfectly effective and believing that, notwithstanding the fact that it is a little more expensive than some other arsenical insecticides, it yet repays enormously any expenditure by the improved condition of sprayed trees; but, if other substances are used, probably the Kedzie mixture is the best. Disparene, or arsenate of lead, is also another very valuable insecticide, one great feature in its favour being the length of time it remains effective on the foliage. Mr. Joseph Tweddle, of Fruitland, Ont., who not only himself grows very satisfactory crops in orchards which he has sprayed, but has also done much work in spraying orchards for other fruit growers, who have been well satisfied with the treatment used by Mr. Tweddle, tells me that the spray which he uses is made as follows:—'I boil half a pound of white arsenic in one gallon of water with one pound of lime for 45 minutes, and make up to the original quantity of water when it is finished boiling. I use this in 50 gallons of Bordeaux mixture for apple and pear trees, except for the third or fourth treatment when it will sometimes burn the foliage if used at this strength. I have never used it on plums and cherries at the above strength without doing some injury, and would always advise care in spraying so as not to drench the trees. I find this mixture very effective against all leaf-eating insects. When spraying peach trees for Curculio I use this mixture of half the strength without the Bordeaux mixture, and when with the latter not more than one quarter strength.'

Prof. C. P. Gillette, of Colorado, recommends a somewhat simpler method of preparing arsenate of lime, which is to boil for three-quarters of an hour one pound of white arsenic and two pounds of fresh lime in one gallon of water, and of this he uses one quart to an ordinary barrel of 40 gallons. Prof. Gillette also draws particular attention to the necessity of using fresh lump lime and of exercising the greatest care in labelling everything containing this mixture plainly 'Poison.'

The proportions in which I have found the best known arsenical poisons satisfactory, are as follows :

Paris green—1 pound to 160 gallons of water, with 1 pound fresh lime.

Arsenate of lead—1½ pounds to 50 gallons of water.

Green arsenoid—1 pound to 160 gallons water, with 1 pound fresh lime.

The APPLE-LEAF SEWER [*Ancylis (Phoxopteris) nubeculana*, Clem.].—Apple orchards at Fruitland, Grimsby, St. Catharines and Niagara-on-the Lake, were to a moderate extent infested last autumn by the small caterpillars of this insect. The sewed leaves were conspicuous on the trees in autumn. Inside these leaves, which fall to the ground, the caterpillars remain until the following spring, when they change to chrysalids; and the pretty moths, which are shown at fig. 13, appear in May and June. The chrysalis works its way through the leaf, and, when the moth escapes, the empty skin remains attached to the leaf. This insect has never been a serious pest to the apple grower, and is only sometimes sufficiently abundant to attract notice. The only remedy which has been recommended, is to rake up the leaves in the autumn and burn them.

Fig. 13.—The Apple Leaf-sewer: *a*, caterpillar; *b*, pupa case on leaf; *c*, moth—*a* and *c* enlarged.

The APPLE-LEAF MINER (*Tischeria malifoliella*, Clem.)—Rather more abundant than the above and more destructive was this small leaf-miner. It occurred in several orchards near Grimsby, and Mr. Joseph Tweddle reports it as being sufficiently abundant to require attention. It has been noticed more or less in this same district for several years, specimens having been sent once or twice by Mr. Geo. E. Fisher, of Freeman, Ont., who had noticed it in orchards and nurseries in the above named district, when inspecting for San José scale. I do not think that it is ever likely to develop into a serious enemy, but it is advisable for students of insects to find out a little more than is at present known concerning its exact life history, so that, in case it ever requires special treatment, we may be prepared with a practical remedy, which as yet is wanting. The only remedy now suggested is to burn the fallen leaves in infested orchards, either in autumn or before the moths leave them in the spring.

The APPLE APHIS (*Aphis mali*, Fab.).—Plant-lice of all kinds have been noticeably abundant on many crops throughout Canada and the northern United States during 1903. Although this has been the case, it cannot be said that their injuries have been excessive, for in nearly every instance, they were attended by large numbers of their natural parasites, which soon reduced the numbers so much that they were unable to do appreciable harm. The only injuries which could be considered serious, were where the insects attacked young stock in nurseries and fruits while young. Some of our large nurserymen in western Ontario inform me that Apple Aphis did them considerable harm last season, particularly upon budding stock, late in July and in August. In Prince Edward Island and in British Columbia, an injury which I have already alluded to as caused by the Apple Aphis, was again this year apparent on apples. This injury is of a serious nature, and takes the form of deep pits which are left on the growing fruit at spots where apples have been punctured by the aphis when they were small. This gives the fruit a distorted, gnarled appearance which renders it quite unsaleable.* As a general thing, except in British Columbia, it is not advisable to go to the expense of spraying bearing apple trees for destroying the Apple Aphis. The insects are most abundant when they first hatch from

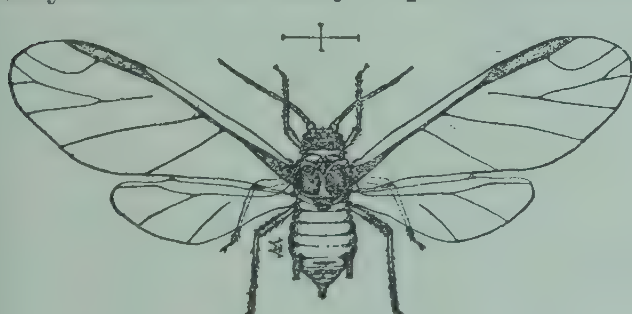

Fig. 14.—The Apple Aphis—enlarged.

*See Fig. 15, next page.

the eggs, in which form they pass the winter. At that time the plant-lice cluster on the buds to such an extent as to almost hide them. With the rapid expansion of the foliage, they are soon lost sight of, and it is very seldom that serious injury results from their presence. Late in the autumn, when they come back again to apple trees after passing some time on grasses and fall wheat, they are again found in large numbers upon apple trees, where they lay their eggs. In British Columbia, this insect is one of the most destructive orchard pests the fruit-grower has to deal with, and treatment of infested trees is frequently a necessity.

It may also be noted that, although the Apple Aphis was troublesome last season in many parts of the Pacific province, Mr. Venables expressly states that the Apple Aphis was less abundant than usual at Vernon, although one might have expected it to have appeared in great force, judging from the large number of eggs laid in 1902. These, however, for the most part failed to hatch last spring. The Apple Aphis is a green plant-louse, having the head, the eyes and the thorax black. The head is pointed in front, and the prothorax has lateral tubercles. The antennæ are shorter than the body. On comparing this species with the Grain Aphis, which very much resembles it, the most striking differences are that in the latter species the eyes are reddish, the head and thorax brown and the head not pointed in front. The antennæ, which are a little longer than the body, are also borne on distinct frontal prominences. A remedy which answers well for the Apple Aphis, is to spray the infested trees thoroughly with whale-oil soap, one pound in six gallons of water, or with a tobacco and soap wash made by soaking ten pounds of tobacco leaves in hot water for a few hours, then straining off the liquid and adding two pounds of whale-oil soap. Stir until all is dissolved and fill up to make 40 gallons. If this wash is applied as a spray two or three times at short intervals, little difficulty will be met with in destroying the Apple Aphis.

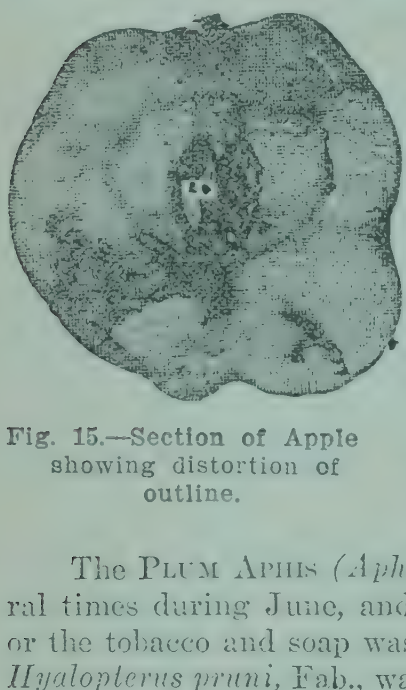

Fig. 15.—Section of Apple showing distortion of outline.

The injury to apples referred to above resembles very closely that of the small British Columbia Apple-fruit Miner *(Argyresthia conjugella,* Z.), as shown at fig. 15.

The Plum Aphis *(Aphis prunifolii,* Fitch) was mentioned by correspondents several times during June, and trees infested were sprayed promptly with whale-oil soap or the tobacco and soap wash with good effect. In British Columbia an allied species, *Hyalopterus pruni,* Fab., was reported by Mr. E. P. Venables, of Vernon, B.C., as being in greater numbers than for several years past. The insect was also observed at several other places in British Columbia, both on the mainland and in Vancouver Island.

The Cherry Aphis (*Myzus cerasi,* Fab.).—This is a black plant-house, which frequently appears in large numbers early in spring and clusters around the young fruit and along the stems of the fruit and leaves, sucking the sap and doing much harm. The eggs are laid upon the twigs during the autumn, the young plant lice not hatching until the following spring. This plant-louse has done a considerable amount of harm in western Ontario for several years, and during the past summer, although in most places it disappeared early in June, in others much loss resulted from its attacks. Mr. J. B. Fairbairn writing from Bowmanville, Ont., says: 'I have two English cherry trees that for years have had their crop ruined by this pest; two seasons ago I planted out three Montmorencys, and I find they also are covered with these insects. It seems almost impossible to destroy them without injuring the trees.' The Cherry Aphis is one of the class known as Black Plant-lice, and it is a remarkable fact which has not been accounted for, that all of these dark coloured plant-lice are much harder to kill than those which are of a green or light colour. For the Apple Aphis, Hop Aphis and other green-coloured species, one pound of whale-oil soap in 8 or 10 gallons of water is suf-

ficiently strong to destroy them; but, for the black species, I have found that six gallons of water to one pound of soap is the greatest dilution which can be used. An important point, too, in fighting this insect, is early work, because, as the egg is upon twigs all through the winter, and the young hatch there in spring, they are easily reached with a small amount of spraying material, and early treatments before the leaves have expanded, have been found most effective. The kerosene emulsion may also be used with great success at any time after the weather becomes warm in spring, and before the leaves expand. For this purpose, the stock emulsion should only be diluted with six parts of water, instead of nine, as in the usual dilution for use upon foliage.

The Red-humped Apple-tree Caterpillar (*Schizura concinna*, S. & A.).—These voracious caterpillars were sent in from Nova Scotia, Quebec and Ontario, and were reported from British Columbia. Altogether, the species seems to have been rather more abundant than usual. The appearance of these caterpillars is well shown at fig. 16. The colours are as follows:—Head bright red, as is also a conspicuous hump on the fourth segment. The sides are striped with black, yellow and white lines. The blunt spines on the back are black. When at rest, the end of the body is raised and has, when viewed sideways, somewhat the shape of a dog's head. When full grown in autumn, they are a little more than an inch long. They then spin close parchment-like cocoons among the leaves on the ground, or a short distance beneath the surface, in which they remain unchanged until the following spring, when they assume the chrysalis condition, and the moths emerge towards the end of June. These are plainly coloured but prettily marked in varying shades of brown, which make them very inconspicuous when at rest, and, although the caterpillar is common, the moths are very seldom seen. These, when the wings are opened, expand from an inch to an inch and a half, the males, as a rule, being much smaller than the females. The eggs are deposited in clusters on the leaves of apple trees and occasionally on a few other kinds of trees, as willow, birch and oak. They are laid early in July, and by the end of that month the colonies of young caterpillars become conspicuous from the thorough way in which they strip whole branches of their leaves. At this time much good may be done by cutting off the branches and destroying the whole colony at once, as they very seldom wander far from each other, and when at rest, are massed together so as to hide the twigs and stem of the branch. The Red-humped Apple-tree Caterpillar has never appeared in Canada in sufficient numbers to be the cause of much loss to fruit growers, and, where trees are regularly sprayed with insecticides, this will never be the case. The species is much rarer in British Columbia than in the East, but I have on several occasions seen colonies upon wild willows, as well as upon apple trees in orchards. Mr. E. P. Venables reports it as more abundant than usual in 1903 at Vernon in the Okanagan valley. Prof. F. C. Sears sent specimens from Wolfville, N.S., Mr. P. E. Choquette, from St. Jerome, Que., and Mr. E. B. Yarwood, from Picton, Ont. A few colonies were also found at Ottawa.

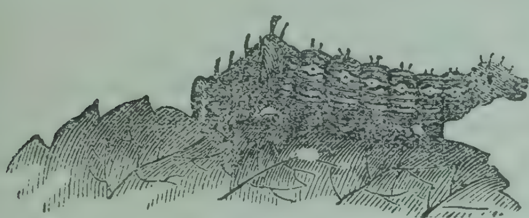
Fig. 16.—The Red-humped Apple-tree caterpillar.

The Pear-tree Slug (*Eriocampa cerasi*, Peck).—The slimy blackish slug-like larvæ were last year, as is too frequently the case with so easily controlled a pest, found very destructive in British Columbia to the foliage of pear and cherry trees. Specimens were also sent from Morrisburg, Ont., by Mr. Gordon Dill. The parent insect is a short, thick four-winged fly, about a quarter of an inch in length. It is glossy black, with pale legs, and has the habit, when an infested

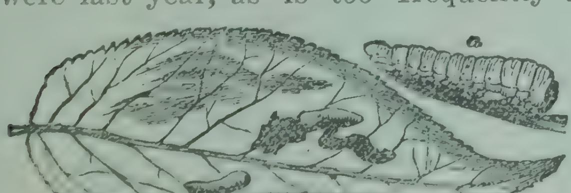
Fig. 17.—The Pear-tree Slug.

tree is touched, of drawing in the legs and falling to the ground. There are two broods in a season, the flies of the first brood appearing and laying their eggs early in June. These are inserted into the tissues of the leaf, where they remain for about a fortnight before the young slugs hatch. The greatest injury is done to fruit trees during July. The larvæ are sometimes, and indeed very frequently, in such enormous numbers as to strip the green cellular tissue from the leaves to such an extent that the foliage of whole trees and even of orchards is destroyed, and the trees are left apparently covered with only dead leaves. This injury, occurring as it does when the trees require the full use of their leaves to bring the fruit to perfection, is a serious one, and its effects last over and affect the crop of the second year. A second brood of larvæ appears in August and September. These, when fully fed, fall to the ground and penetrate a short distance beneath the surface, where they remain until the following year, changing to pupæ about the middle or end of May, and the flies emerge soon afterwards. The Pear-tree Slug, which, as its latin name indicates, attacks also the Cherry-tree, is a very easy insect to control. In properly managed and sprayed orchards it can never be troublesome. Owing to the viscid secretion on the skin any dry, dusty material adheres to it and causes the insect great inconvenience; therefore, dusting trees with freshly slaked lime or even with finely sifted road dust, will have the effect of clearing trees of large numbers. Two or three applications should be made at short intervals. In hot, dry weather dusting trees either by hand or with an insect gun or other implement for the distribution of dry powders, for two days running, I have found quite satisfactory. The material used was freshly slaked lime, to which Paris green was added in the proportion of one pound to fifty, so that in case any of the larvæ, which might have been moulting, escaped, there would still be on the foliage poison to destroy them as soon as they began to feed. The most practical remedy is undoubtedly to spray trees with Paris green or some other arsenical insecticide, one pound to 160 gallons of water. This treatment will not only destroy the Pear-tree Slug but also many other kinds of leaf-eating insects.

The PEAR-TREE FLEA-LOUSE (*Psylla pyricola,* Foerster).—Although up to the present time the Pear-tree Flea-louse, called also the Pear-tree Psylla, has not been the cause of widespread injury, still there are every year complaints of more or less serious loss in pear orchards in western Ontario. I have found this insect to be abundant when looked for in orchards, throughout the Niagara district and along the north shore of Lake Erie. During the last summer I have had it sent to me from two localities in Nova Scotia, and believe it to be also present at other places from which no specimens have been received. Prof. Lochhead, of the Ontario Agricultural College, writes me as follows :—

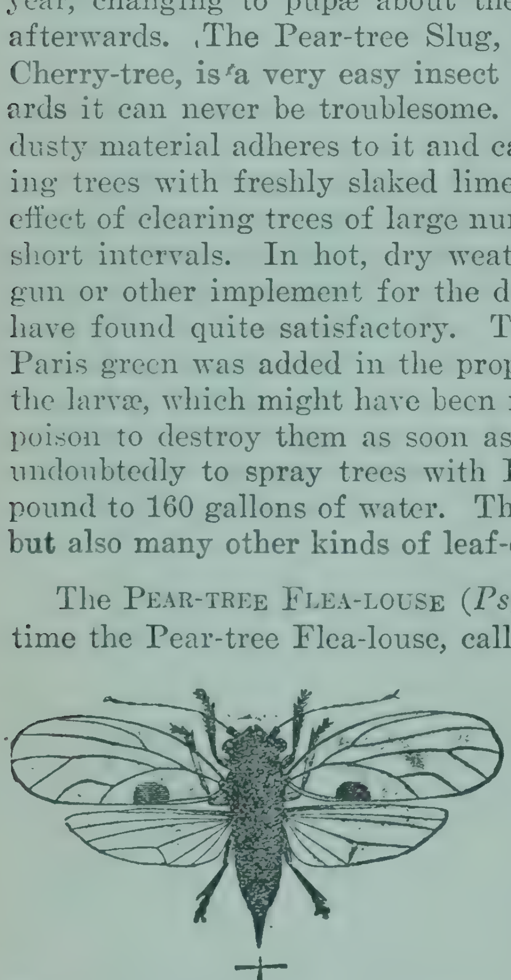

Fig. 18.—The Pear-tree Flea-louse : perfect insect—enlarged.

'This insect has been very injurious this past season, more especially in the Grimsby district.' A correspondent writes:—'When I came home on July 4, many trees were fairly covered with it. The insects were mostly wingless, with a few winged forms. They are found in the axils of the leaves, along the petiole and along the blade, but are chiefly found on the leaves a short distance from the vein or just in the axils of the secondary veins or mid-veins. In the first place, the tissue of the leaves dries up in spots where they are situated; but in the latter case they cause a drying of the tissues along the edge of leaf at the outer extremity of the vein. When the psylla is situated in the secondary axils of the leaf, the petiole seems yellowish in colour and the attachment to the stem seems weak. About July 15 to 25 the psyllas were most abundant—the number of winged forms increasing until the 25th. A heavy rain on the 23rd cleared the trees of the honey-dew, and seemingly of quite a number of the psyllas. After another heavy rain on the night of July 27, I noticed

that there were very few of the wingless forms, but a great number of the winged ones. Up to this time very few leaves had fallen off, although the growth of the trees was completely stopped; in fact, our trees have apparently made no growth at all this year, excepting a few that were free from the Psylla. At the time of writing, August 27, the wingless forms have again become numerous and the winged ones few.'—W. R. DEWAR.

Mr. John Chute, of Berwick, N.S., also observed that those of his trees which were infested by the Pear-tree Flea-louse made no growth.

This insect was first noticed as injurious in Canada in 1894, and a short account of it, with the best remedies for controlling it, appeared in my annual report for that year. The attack may be described as follows:—Small clear-winged insects, wedge-shaped like miniature cicadæ, the head being broad, flat in front, and the body pointed behind; one-tenth of an inch in length, of a reddish brown colour, with broad black bands across the abdomen. These insects, at the slightest disturbance, leap from the foliage of infested pear trees and fly for a short distance. With the above described form, there will be found on the leaves the curious flattened oval larvæ, which, when first hatched, are extremely small, only one-eightieth of an inch in length, of a semi-translucent yellow colour, with bright red eyes. These grow rapidly, and in about a month pass through five nymph stages, during which the body retains its flattened form and becomes much darker until, in the full-grown nymph, the large wing-pads and the greater part of the upper surface are black. The eyes and sometimes the body between the black markings are crimson. The presence of this insect upon trees is easily detected by the copious secretion of honey-dew with which the leaves, limbs and trunks of the trees soon become covered, and upon which the dirty looking Sooty Fungus *(Fumago salicina)* develops. After a time the leaves and young fruit fall off and the trees assume an unhealthy, gnarled appearance. Hardly any new growth is made, and in cases of severe attack, trees die.

The life-history of this insect has been carefully worked out by Prof. Slingerland, of Cornell University, and has been fully described in Cornell Bulletin No. 108, published in 1896, as well as in U. S. Div. of Ent., Circular No. 7, 2nd series, by Mr. C. L. Marlatt.

The remedies for this insect are the spraying of the trunks of trees which are known to have been infested, during the winter or early spring, with kerosene emulsion, whale-oil soap solution, or whitewash. This is to destroy the hibernating adults, which pass the winter hidden away beneath flakes of bark or in crevices.

The eggs are laid very early in spring long before the leaf buds expand. After leaving their winter quarters and after the sexes have mated, the females lay their curious pear-shaped and tailed eggs (fig. 19) near the tips of the young wood. The young flea-lice hatch from these about the middle of May or sooner, and immediately begin sucking the sap from such leaves as have unfolded. Mr. Joseph Tweddle, of Fruitland, Ont., tells me that he obtained very satisfactory results in destroying the Pear-tree Psylla in orchards which he had sprayed with the lime and sulphur wash to control the San José Scale. He was under the impression that the mixture destroyed the egg upon the young wood, which is highly probable. It frequently happens that fruit growers do not know of the presence of this enemy in their orchards until they notice their pear trees becoming dirty and black during June, or a little later in the year notice that the leaves are falling. As soon as the insect is noticed in sufficient numbers to cause injury to the trees, these

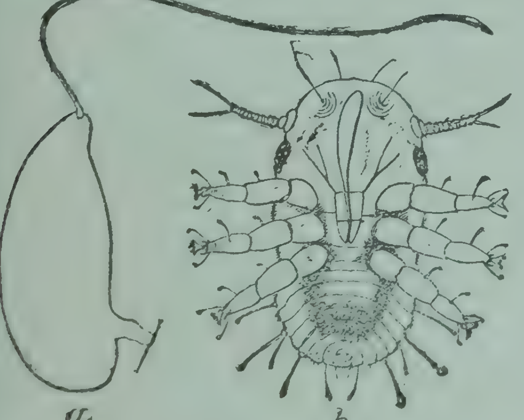

Fig. 19.—Pear-tree Flea-louse: *a*, egg; *b*, larva—both greatly enlarged. (Marlatt, U.S. Dept. of Agriculture.)

latter should be sprayed at once with the ordinary one to nine kerosene emulsion or with a whale-oil soap solution of one pound to six gallons of water. This will destroy large numbers both of the nymphs and also of the mature insects. The most effective work, however, is done during the winter, when nearly all of the adults resort to the trunks and larger limbs for hibernation. In my report for 1900, at page 239, I drew attention to some good work which had been done by Mr. Henry Lutz, of Youngstown, New York State, by spraying with a lime wash. In 1896 a large Duchess orchard belonging to him was almost ruined. In February, 1897, the whole orchard was thoroughly sprayed with whitewash, and two years afterwards this orchard was almost free from Psylla. Mr. Lutz explains his plan as follows:—'During the cold weather in December we spread a canvas under the trees and then scrape off all the rough bark. This dislodges many of the torpid insects, which are burnt with the scrapings. We then give the trees a thorough coating of slushy whitewash made of freshly slaked lime that had been run off in a putty state, as masons usually make it for plastering. We thin this with skimmed milk and put it on the trunks of the trees with a brush, for those parts of the tree which we can reach. We thin down the whitewash with more milk and then give the whole tree a thorough spraying. In this way we destroy a large number of the hibernating Psyllas, and those which are not killed are so well sealed up that they cannot get out to lay their eggs. We spray again in March to coat the wood and buds, so that the few that are alive can find no favourable places to lay their eggs. The orchard where we experimented contained 1,000 trees, which were practically worthless, but since we began using the lime the trees have steadily regained their vigour.'

The PEAR-LEAF BLISTER-MITE *(Phytoptus pyri,* Nalepa).—This enemy has now spread to every part of the Dominion where pears are grown. Specimens were sent from Prince Edward Island by Mr. E. J. McMillan, the secretary of Agriculture for that province, and within the same week in June specimens came in for report from the provinces of Quebec and Ontario. Mr. E. P. Venables, writing from Vernon, B.C., says:—'Pears suffered from the attacks of the Pear-leaf Blister-mite. This insect threatens to become a very serious enemy unless measures are taken to subdue it. I found that the lime, sulphur and salt spray was very useful in destroying it. It was applied just before the buds burst. One tree upon which the leaves were simply black with the work of the mite, was treated thoroughly and the following year was practically free from the insect. A few branches at the top of the tree, however, were as bad as ever. These had not been reached by the spray.'

Frequent experiments have shown that the best treatment for this pest is spraying the trees thoroughly with the lime, sulphur and salt wash just at the time the buds are bursting. The mites pass the winter hidden away securely beneath the bud-scales, which by the expanding of the buds in spring are opened up sufficiently to allow the entrance of liquid. Kerosene emulsion is useful to a certain extent, but sulphur has a specially fatal effect on all mites, and in practice the wash above mentioned has proved the best remedy against the Pear-leaf Blister-mite. See below for receipt of lime and sulphur wash at page 199.

THE SAN JOSE SCALE *(Aspidiotus perniciosus,* Comstock.)

This notorious insect has done much harm in Ontario orchards during the past season. The only part of Canada where the San José scale is now found as an orchard pest is in the Niagara peninsula and in the counties along the north shore of the western end of Lake Erie. The infestation has, however, decidedly increased a great deal during 1903, and has involved new orchards within the area known to be infested at the end of 1902. It is a matter of congratulation that the pest has not spread beyond those limits; for, although most of the leading fruit-growers seem to understand the danger

of neglecting this terrible pest, yet there are many owners of small orchards who are doing nothing whatever to save their trees, and these centres are sources of public danger. An interesting occurrence of the small parasitic beetle *Pentilia misella*, Lec., was brought to my notice by Mr. W. O. Burgess, of Queenston, Ont. This useful little coccinellid was found in some abundance on apple and plum trees infested by the San José scale. It is a well known parasite of that scale insect, and although it has on several occasions been found in considerable numbers in infested orchards, I have never been able to see that it affected the abundance of the scales appreciably.

The Minister of Agriculture still maintains the fumigating stations at Vancouver, B.C., Winnipeg, Man., Windsor and Niagara Falls, Ont., St. Johns, Que., and St. John, N.B.; and a great deal of nursery stock has been passed through them during the past season. A rigorous watch has been kept on every kind of nursery stock which could possibly bring in fresh importations of the San José Scale, and I have again this year the greatest satisfaction in reporting that no single instance has been brought to my notice of living scales having been detected on trees which had passed through the fumigating houses. The superintendents at all of the stations have done their work carefully and well, and no complaints have been received from importers, either as to the slight delay which must occur while the stock is being treated, or as to any injury to the trees during the necessary unpacking, handling and repacking. Careful experiments have shown that the formula used at our federal fumigation stations is thoroughly effective in killing the San José Scale, and does not in any way injure the stock submitted to the gas. The formula used is one ounce of cyanide of potassium (98 per cent), one ounce of commercial sulphuric acid and three ounces of water—exposure, 45 minutes.

During 1903 the experiments which had been carried on up to that time by the Ontario government to discover a practical remedy for the San José Scale were discontinued. After having demonstrated by the excellent work and most careful experiments of Mr. Geo. E. Fisher that this insect could be controlled by practical measures, the Provincial Minister of Agriculture considered it wise not to carry on these experiments any longer. Consequently, during the past summer, although helped with advice and publications by the Provincial Department of Agriculture and Prof. W. Lochhead, of the Guelph Agricultural College, fruit-growers have had to attend to this part of their work themselves. Some have applied the recommended measures and have been quite successful in their efforts when the work was done thoroughly, but the scale has increased to an alarming extent during 1903. The consensus of opinion is that when the well known lime, sulphur and salt wash, or the recent modification of it, in which the salt is omitted, is applied thoroughly as a late winter wash, it is a safe and reliable remedy for the San José Scale. It kills by contact with the scale and acts mechanically by coating the trees so that they are unsuitable for the young scales to establish themselves upon. This wash is used as a winter wash, and should be followed in summer with sprayings of the 1 to 6 kerosene emulsion. The preparation, as described in previous reports and as used to-day in many places, consists of about one pound of lime, half a pound of sulphur and six ounces of salt to every gallon of water in the wash when ready for use. Mr. G. E. Fisher, who tried an enormous number of experiments, found that the results of his investigation justified him in recommending that the salt might be omitted without loss of insect killing power. The original formula of the California wash is :

LIME-SULPHUR-SALT WASH.

Lime, unslaked	40 lbs.
Sulphur	20 "
Salt	15 "
Water	60 gallons.

The chief difficulty in making this wash has been the expense and inconvenience of boiling it for two or three hours, so as to thoroughly dissolve the sulphur. This may

be done either directly over the fire in iron kettles or in barrels by means of a jet of steam. Mr. G. E. Fisher describes his method of preparing this useful wash on a large scale, as follows:—

'There are a great many ways of preparing lime and sulphur wash for spraying, and nearly every one who does it prefers his own way. When large orchards are to be treated, it is not practicable to cook the material to be used, by boiling it in kettles over the fire. In my practice I found that, with the aid of steam from an ordinary threshing engine, this most effective spraying material could be supplied in large quantity perfectly cooked and at a cost of from one cent to one and a half cents per gallon. A 12-horse power boiler will not furnish steam enough to cook 12 barrels at once, without extra heavy firing, and, with ordinary firing, such a boiler will not properly run more than 8 or 9 barrels, which will cook probably about 1,200 gallons of spraying material in 10 hours. The greatest drain upon the steam is in starting, when the water is all cold, and, to expedite matters and get some of the barrels under weigh, I found considerable advantage in starting about one third of them. We fill four barrels one-quarter full and then turn on the steam. With steam at from 80 to 100 lbs. pressure, these will be boiling in five minutes, when the steam is turned off these and on to four more barrels, and all the lime and sulphur are put into the first four as quickly as possible without making them boil over. It is best to turn off the steam while the lime is being slaked, as it lessens the danger of making the mixture boil over. When the lime is all slaked, the steam is turned on again and the mixture is left boiling until cooked. When the second four barrels are boiling, the steam is turned on to the third lot as with the first two, always returning the steam to the barrels as soon as the lime is all slaked. Managing in this way, we always had some material ready for use. That which is prepared late in the evening will still be warm enough in the morning, even in cold weather. In order to make up for the loss of liquid from boiling and to gradually fill the barrels to the proper depth, a small stream of cold water was kept dribbling into them at a rate which allowed the barrels to fill in the course of the two or three hours' cooking necessary to reduce the sulphur. In this way the mixture was kept boiling all the time and the necessary amount of liquid was added. For boiling the mixture in the barrels, we have a quarter-inch pipe which reaches down to within four inches of the bottom of each barrel, and each pipe is provided with a stop-cock.'

'When using a kettle, if I have only one, it is filled about one-third full and brought to a boil. The lime and sulphur are then added, and an old tin pail with a small hole in the bottom is hung over the kettle, and cold water dribbling from it into the kettle replaces the water which evaporates with boiling and increases the quantity. When kettles are used, if there are two, one may be used for heating water; for, while the mixture is cooking, cold water should not be added in sufficient quantity to check the boiling. I have generally slaked the lime in the barrels or kettles as it was required, but on some occasions we slaked it in another barrel by throwing boiling water over it and with just as good results. We certainly got our best results where each gallon of the wash contained one pound of lime and half a pound of sulphur, which we cooked from two to three hours. It is true Dr. Forbes got his wonderful results from a less quantity cooked one and a quarter hours. Mr. Pease, the California Scale Inspector, says it must be cooked at least three hours and that more cooking is better. He believes that this wash is of little use unless sufficiently cooked. We had good results and perhaps should be satisfied, but I think we have good reasons for using the larger quantity of material and cooking a long time. In Michigan again they used less material even than Dr. Forbes. A very common proportion in the United States is 40 lbs. of lime, 20 lbs. of sulphur, 15 lbs. of salt, in 50 imperial gallons of water.'

Dr. S. A. Forbes, who has been very successful in fighting the San José Scale, uses the Oregon wash and is quite satisfied with it. Writing at the end of the season of 1903, he says: 'I am still using the ordinary Oregon wash of 15 lbs. of lime, 15 lbs. of sulphur and 1½ lbs. of blue vitriol, dissolving the lime and sulphur by boiling for

about an hour and then adding the blue vitriol, which has been dissolved in hot water, and boiling for 15 or 20 minutes longer.'

Mr. W. H. Owen, who has done a great deal of work against the San José Scale, on Catawba Island, Ohio, and has tried all of the different remedies which have been suggested from time to time, wrote me recently: 'In 1903 the original California formula was somewhat modified. The quantities of the new formula being lime 15 lbs., sulphur 15 lbs. and salt 15 lbs. to the 50 gallons of water, and this gave equally good results with the old formula. The Oregon wash of 15 lbs. of lime, 15 lbs. of sulphur and 1¼ lbs. of blue vitriol, is what I used during the past season, and I cannot expect to find anything that will do better work than this, both on the San José Scale and the Leaf Curl. When properly made it surely is a perfect insecticide and fungicide. Too much stress cannot be laid upon proper making; for I believe that failure in obtaining satisfactory results can in most cases be traced to careless making.'

The lime-sulphur-and-salt wash, as made in the old method by boiling for a long time, is very fatal to scales, and many other kinds of insects, and there has been a constant effort made to see if the long boiling cannot be avoided. The point aimed at is to dissolve the sulphur thoroughly by means of the lime and heat, and to form a double sulphide of lime. There is an excess of lime in all the formulas used, but this is in no way detrimental. The mixture, however, is not a pleasant one to use, being caustic if it gets on the bare flesh, and is very destructive to clothes of workmen using it. For this reason old clothes should be worn and the hands should be protected with gloves. It must only be used as a winter wash, for if of sufficient strength to destroy the scale, it would injure foliage as well as sensitive stock in autumn before the buds are dormant; but, when buds are quite dormant, it may be used upon all fruit trees and other hard-wooded plants liable to infestation by the San José Scale. Its effectiveness has been proved by several, and one instance which has been seen by many of our Ontario fruit growers, is the case of some plum and peach trees in the orchard of Mr. W. W. Hilborn, at Leamington, Ont. In the spring of 1903, Mr. Hilborn found that a small block of trees was badly infested with the scale. He at once procured a plant for making the lime and sulphur wash and sprayed the trees thoroughly. These trees were examined by me with great care on November 25 last, and I could not find a single living scale. All experimenters recommend that this wash should be applied while it is hot; but, as a matter of fact, this is seldom done in practice, although those who have used hot or warm wash will notice how much more convenient it is to spray when in this condition, and it certainly is more effective in killing the scale.

A simple formula for making this wash in small quantities is 1 lb. lime, ½ lb. sulphur, and 3 gallons of water.

THE NEW LIME-SULPHUR-SODA WASH.

The chief difficulty in making the wash has been the expense and inconvenience of boiling it for such a long time, to thoroughly dissolve the sulphur, and several of our fruit growers have inquired for information concerning some experiments which have been mentioned in the agricultural press and which were undertaken to dissolve the sulphur with caustic alkali and lime, instead of the troublesome and lengthy boiling. These experiments originated with Professors Victor Lowe and P. H. Parrott at the New York Agricultural Experiment Station, Geneva, N.Y., as set forth in the Station Bulletin No. 228, 1902, and consisted of dissolving the sulphur by means of caustic soda or caustic potash in addition to the lime. In making the wash, 40 lbs. lime were slaked in hot water, using only enough water to make it boil rapidly, and while slaking 20 lbs. of ground sulphur, which has been made into a thin paste, is added and thoroughly mixed with the slaking lime. Five pounds of caustic soda in solution is then poured in with more water as needed, and the whole is stirred thoroughly. As soon as chemical action has ceased, hot water is added to make the wash

up to 60 gallons, and the mixture is then ready for immediate use. In making the above wash, it was found that to secure the proper chemical action the quantity could not be reduced lower than: lime 4 lbs., sulphur 2 lbs., and caustic soda (the ordinary concentrated lye of commerce) ½ lb., water 6 gallons. The rule is to use one-quarter of a pound of caustic soda, or potash, to each pound of sulphur. With the exception of heating the water, the whole of the cooking of this wash can be done in a half barrel, and takes from ten to twenty minutes. From the ease with which this wash can be made and from the fact that Mr. Parrott tells me that, although 'the results upon the scale differed with different lots of the mixture, some of the applications were entirely satisfactory,' I believe it is well that several people should try this method of manufacture. The trouble of making the lime-sulphur-and-salt wash has certainly prevented the use of such a valuable mixture to a large extent. I regret to say that my own work with it did not begin soon enough for me to report upon it now. I can merely say that the lime and caustic potash do dissolve the sulphur and that the appearance of the wash is what it ought to be.

Mr. F. T. Shutt, the chemist of the Dominion Experimental Farms, has kindly carried out some test preparations by this convenient new method of making the wash and has handed me the following resumé of his work:—

ON A NEWLY-PROPOSED METHOD OF PREPARING THE LIME-SULPHUR WASH.

(By Frank T. Shutt, M.A., F.I.C., F.R.S.C.)

In the report of the Division of Chemistry of the Experimental Farms for 1902, the results of a series of experiments in the preparation of the lime, sulphur and salt wash by boiling, are given. Since the appearance of that report a method has been proposed by the New York (Geneva) Experiment Station, which obviates the necessity of boiling—the chief drawback to the more common use of this valuable remedy. The modification consists in the addition, at a certain stage in the preparation, of strong lye, such as Babbitt's or Gillett's. The proportions and preparation as given in Bulletin No. 228 of the above named Experiment Station are as follows:—

Lime (unslaked)	40 lbs.
Sulphur (ground)	20 "
Lye, concentrated	5 to 10 "
Water	60 gallons.

'In the preparation of the mixture the lime was slaked, preferably with hot water, and while it was slaking vigorously, the sulphur, which had been made into a thin paste, was added and thoroughly mixed with the slaking lime. The caustic soda was then added, with water as needed, and the whole stirred thoroughly. As soon as the chemical action has ceased, the required amount of water, preferably hot water, is added, and the mixture is ready for use.'

It will be noticed that in this process there is no boiling and no salt, an ingredient in the old formula which apparently had no direct value, but was useful in raising the boiling point of the mixture, thus ensuring a more complete union of the sulphur and lime.

At the request of the Entomologist (Dr. Fletcher), we made several trial preparations in the laboratory and found that the proposed method is quite workable and simple, and yields a product in which there is *very little uncombined sulphur.* This latter is an essential point, as undoubtedly it is the sulphur compounds that give this wash its great value for destroying the scale. It is necessary to this end that the sulphur be added (in a thin paste) while the lime is still actively slaking—for which purpose care should be taken to use only a sufficiency of water—and the mass stirred

vigorously. As soon as the sulphur paste is poured on to the slaking lime, add the solution of lye, with such further quantities of water as may be necessary, stirring and mixing, until all bubbling ceases. There is now an orange-yellow, pasty, homogeneous mass, which can be diluted to the requisite volume, either at once or at any subsequent time, if kept out of contact with the air.

As far as one can judge from what might be called the chemical or physical point of view, this wash should prove equally effective with that prepared by boiling.

F. T. S.

In an excellent bulletin just issued by Prof. J. B. Smith, of New Jersey, entitled 'Insecticides and their use,' this lime, sulphur and soda wash is mentioned and some valuable suggestions are made. Prof. Smith says: 'This wash has been found quite effective, but it is not so good as the boiled mixture, and costs a little more.' He also draws attention to the fact that warm water must be used as well as a good quality of stone lime and of caustic soda, and further that it must be remembered that a can of lye does not equal a pound.* He further states that 'all these combinations of lime and sulphur are more or less unstable and sooner or later the lime settles and the sulphur forms long spicules. When this occurs, the mixture is ineffective in proportion as the sulphur has become separated out. The best boiled combinations become useless in forty-eight hours, and in all cases the wash is most effective just after it is made.'

The above extracts from Prof. Smith's bulletin indicate the importance of using the lime and sulphur washes while fresh; but the statement that 'the best boiled combinations become useless in forty-eight hours,' is probably too sweeping.

A point upon which too much stress cannot be laid is the great importance of washing out thoroughly all pumps and hoses used for spraying caustic or corrosive insectide and fungicide washes.

FOREST AND SHADE TREES

Forest insects and those which attack shade trees in cities, have been, on the whole, less injurious than usual during the past season. There were, however, one or two outbreaks which require mention. The White-marked Tussock-moth has increased very much in the cities of Toronto, Montreal and Kingston, so much so that remedial measures are now urgently needed, or the beautiful shade trees in those cities will suffer irreparably at no distant date. Something has been done in the past by the city authorities to control this insect, but of late years they seem to have relaxed their efforts, and the insect is increasing in numbers. A remarkable outbreak of the Maple Soft Scale (*Pulvinaria innumerabilis*, Rathvon) occurred on shade trees in the cities of London, Woodstock and Hamilton, as well as in other places in south-western Ontario. The well known Fall Webworm (*Hyphantria textor*, Harr.), which for some years has been occurring only in small numbers, during the last season increased sufficiently in most parts of the Dominion to attract general attention. The unsightly webs were very conspicuous in British Columbia and in many places in Ontario and Quebec. The webs of the caterpillars are so easily seen that this insect, if attended to, can be controlled with comparative ease, by spraying the trees with poisonous applications or by cutting off the webs, each of which contains a whole colony of

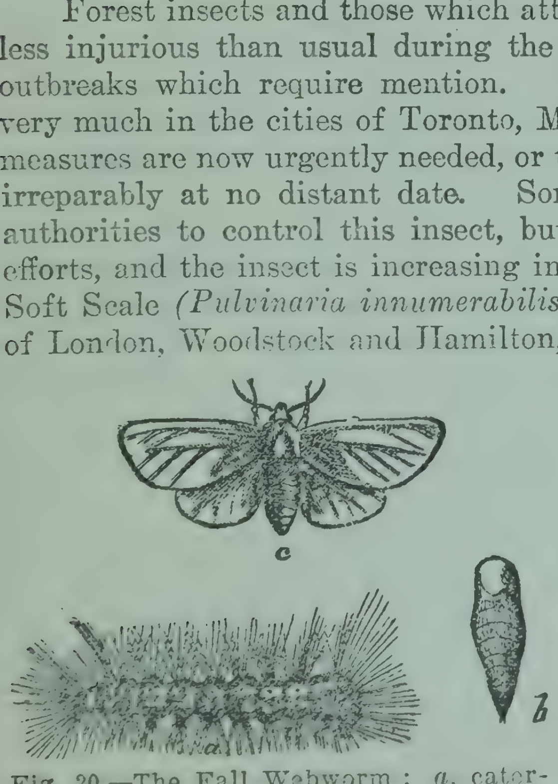

Fig. 20.—The Fall Webworm: *a*, caterpillar; *b*, pupa; *c*, moth.

*The contents of several cans of concentrated lye which were examined here in no case quite came up to 1 lb. avoirdupois.

caterpillars. This must, however, be done before the caterpillars reach full growth, or the work is useless. I have known of one instance where a municipal body with all good intentions employed a man to cut out all of the webs of this insect and those of the Tent Caterpillar in winter time, under the supposition that by this means they were controlling those enemies. It is true the trees were more sightly when these nests had been removed; but the operation in no way affected the abundance of the species the following summer, because the caterpillars only live in the nests until nearing full growth, when they leave them and pupate or build their cocoons in other places. The Tent Caterpillars pass the winter inside the eggs, which may be found on trees, and the Fall Webworms as pupæ buried in the ground. Prof. Lochhead reports 'that the Fall Webworm was very abundant in western Ontario late in summer, not only on shade trees, but on many kinds of fruit trees, and unquestionably did considerable harm. On account of the scarcity of labour in rural sections, few attempts were made to get rid of the ugly webs filled with caterpillars. Unless parasites thin them out very much, there is every likelihood that the Fall Webworms will be very numerous next season.' The Negundo Plant-louse *(Chaitophorus negundinis,* Thomas) was observed as injuriously abundant in Winnipeg, Regina and Calgary, the shade trees, which are largely Ash-leaved Maples, being much disfigured by the copious deposit of honey-dew on the leaves, and the Sooty Fungus which grows upon it. These trees attracted swarms of flies during the daytime and of moths at night. The remedy recommended for clearing these trees was to spray them with kerosene emulsion, 1 to 9, or whale-oil soap, 1 pound in 6 gallons of water, with or without tobacco. The tobacco, however, adds considerably to the killing value of the wash. The Spruce Gall-louse *(Chermes abietis,* L.) has spread widely through the Dominion, and has been the cause of a good deal of injury to spruce trees. In the forest, nothing can be done to check the spread of the insect; but in the case of ornamental trees, good results have followed spraying with a tobacco and soap wash. The Fall Cankerworm was very abundant and destructive in the woods around Ottawa early last spring. The caterpillars were not quite full grown on June 12 last, when the first heavy rains came, which broke the exceptional drought which up to that time had prevailed throughout eastern Ontario. Previous to that they had been literally swarming in many woods along the Ottawa river. After the rains they suddenly disappeared, and the total absence of both male and female moths in the woods in autumn was noticed by many. It is possible, therefore, that there will not be a recurrence of this attack for some time. The Birch Skeletonizer *(Bucculatrix canadensisella,* Cham.) did some harm to birch trees of all kinds again last year in eastern Ontario. The attack, however, was not nearly so severe as in the two previous years, nor was its work supplemented by that of the large aphis, *Callipterus mucidus,* Fitch, and the small green leaf-hopper, *Empoasca smaragdula,* Fall., which for the last two years have perhaps done as much harm to trees on the Central Experimental Farm as was done by the *Bucculatrix* caterpillars. On my return to Ottawa on August 21 last I found the birch trees on the ornamental grounds of the Central Experimental Farm attacked in some places by the Birch Skeletonizer to such an extent that some trees looked about half clothed with foliage. These were at once sprayed with a whale-oil soap and tobacco wash, which was quite effective, and no further injury was done. Should this insect again occur, trees should be examined in July and early August, and, if the small caterpillars or the round white pseudo-cocoons in which the caterpillars pass their moults are seen in numbers, the trees should at once be sprayed before the foliage is injured to a conspicuous extent.

THE WHITE-MARKED TUSSOCK-MOTH

[*Hemerocampa (Orgyia) leucostigma*, S. and A.]

Attack.—Slender, sparsely hairy caterpillars, from one and a quarter to one and a half inches in length, blackish above and paler beneath, with two bright yellow stripes along the back, most conspicuous towards the end of the body. There are four short brush-like tufts of whitish hairs on segments 5, 6, 7 and 8. The head chestnut red; a large patch on segment 2, and two small glandular spots on segments 10 and 11, bright vermilion red. From each side of segment 2, close behind the head, are long plume-like tufts of black, barbed and knobbed hairs; a similar plume ornaments segment 12. When full grown these caterpillars have a decidedly handsome appearance, which is well represented in the accompanying figure. The male moth measures about an inch and a quarter across the wings, and is marked as shown in Fig. 22. The colour is gray and the wings are crossed by wavy bands. The base of the fore-wings bears a dark patch, and there is another of smaller size towards the tip. The popular name is given to this moth from the presence of a small white spot near the outer hind angle of the fore-wings. The female is a large-bodied wingless pale gray creature, with only rudiments of wings. On emerging from the cocoon she crawls on to it and seldom moves from it. After pairing, she lays a mass of eggs, from four to five hundred in number, generally on the outside of her cocoon, and then dies there. These eggs are covered over as laid with a white frothy fluid, which dries over the eggs and protects them through the winter. There is in Canada only one annual brood of this insect. The eggs may be found during the winter on the trunks of trees upon which the caterpillars had fed the previous season. The young caterpillars emerge from the eggs at the end of May or early in June, and soon crawl up and distribute themselves throughout the foliage of the trees, feeding at first beneath the leaves, and when disturbed letting themselves down by a slender silken thread. By the middle of July the caterpillars have for the most part become full grown and are preparing to spin their cocoons. As they increase in size, they become very ravenous and strip entire trees, eating the cellular tissues between the veins of the horse chestnut leaves, which appears to be the favourite food plant, and producing a characteristic injury, which is easily recognized. These caterpillars have a habit of wandering from branch to branch and from tree to tree, which has given rise to the practice of banding trees with strips of cotton batting. This gives a very untidy appearance to streets and does not do very much good, certainly not enough to atone for the unsightly appearance of the trees. The most effective remedies for the White-marked Tussock-moth are (1) the collection of the conspicuous egg masses from the trunks in winter or before they hatch in spring. This may be easily done by means of a small wire brush on the end of a long pole which will reach up among the larger branches of the trees. Such a brush as this was devised by the late Alderman Hallam, of Toronto, and used to good effect on the city shade trees during a previous outbreak of this insect. (2) Undoubtedly the best remedy is the systematic spraying

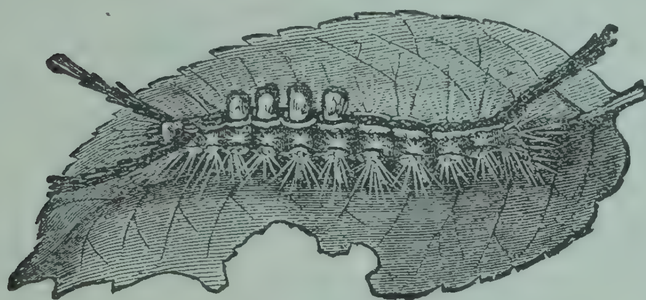

Fig. 21.—The White-marked Tussock-moth: caterpillar.

Fig. 22.—The White-marked Tussock-moth: male moth.

Fig. 23.—The White-marked Tussock-moth: female moth.

of shade trees with some arsenical poison as soon as the young caterpillars hatch from the egg, or as soon afterwards as possible. This work, if properly done, will destroy every caterpillar and render unnecessary the collection of the eggs in winter and the use of unsightly tree protectors, bandages of cotton batting, or sticky substances, all of which are more costly and objectionable. It might be well to point out that, when municipal bodies adopt the plan of collecting the cocoons in winter, it would be well to place these for a time in some place where any parasites which might be passing the winter in the cocoons could emerge and escape, but where the young caterpillars upon emerging would find it impossible to gain access to any trees. This might be done by putting them in an upper room of some building from which the parasites could fly out of the windows, but from which the young caterpillars could not crawl to trees which would serve them as food. Deprived of food, they will soon starve after leaving the egg.

THE APIARY

The Apiary, as in the past, has been under the management of Mr. John Fixter, the farm foreman, whose report I append herewith. The same experiments which have been carried on for some years have most of them been repeated on account of the large amount of interest which has been evinced in the subject by correspondents and visitors to the Central Experimental Farm. The services of Mr. Fixter have been asked for at a great many meetings of bee-keepers, and, whenever his duties at the Central Experimental Farm would permit of it, he has attended these meetings and given addresses.

REPORT OF MR. JOHN FIXTER.

The season of 1903 has been a poor one in the Ottawa valley, but in the greater part of western Ontario the crop has been excellent both as to quality and quantity; parts of the province of Quebec also report good crops, principally where Bokhara clover grows extensively; also in districts which had sufficient moisture in the spring.

The season opened very early; the colonies were set out on their summer stands on March 21. The temperature on that date being 48; and the day bright and mild was most favourable for the cleansing flight of the bees. Then followed several days of cool windy dull weather, which kept the bees confined to their hives; this continued all the rest of March. April was also very unfavourable, being cool and windy. During the greater part of the latter month there was only about three-quarters of an inch of rain, all growth and bloom being thus kept back. May set in warmer; the bees gathered pollen freely, and built up fairly well. It was necessary to feed the bees during May to keep up brood rearing. Only about a quarter of an inch of rain fell during May, and up to June 8 the land was so dry and hard that no clover of any account came in bloom. After June 8, abundance of rain fell, many flowers appeared, and the small amount of surplus honey was gathered after that date. Swarming was light owing to the poor season. There being no fall honey flow from any source all supers were removed on August 26.

On September 1 all colonies were weighed; any that did not weigh 50 pounds and over were fed. When feeding, care must be taken not to feed weak swarms, but the strong ones; then, when these have filled the frames these latter should be given to the weak colonies: otherwise the weak colonies are liable to get robbed. A much better plan of bringing colonies up to the required weight is, in the extracting season, to save some of the well-sealed combs to fill up the light colonies with them. There is then very little danger of their being robbed.

On November 24 all colonies were weighed and found to be in good condition. They were then put into their winter quarters.

Returns from the Experimental Farm apiary averaged 23 lbs. per colony.

Meetings were attended during 1903. The Ontario Bee Keepers' Association at Barrie and Trenton; also farmers' and beekeepers' joint meetings at the following places: Manotick, North Gower, Stittsville, Richmond, Malakoff, Lanark, Wellman's Corners, Bell's Corners, Jockville, Carp, Kinburn, Smith's Falls, Leonard, Metcalf, Balderson and Innisville, in Ontario; Grenville, Lachute, St. Andrews, Como, Buckingham and Templeton in Quebec.

INSULATING HIVES FOR OUTSIDE WINTERING.

Two colonies of equal strength with good laying queens in Langstroth hives were taken for this experiment. The hives were insulated against the winter cold by air cushions in the following manner:—

Slats 1 inch thick are nailed at intervals all round the hive, on these is packed one layer of thick brown building paper and then a layer of oiled paper, which increases the durability and keeps out vermin. In order to provide extra protection to the hive, a box six inches wider and six inches longer was placed over it with an opening cut at the entrance 1 inch by 2 inches, all other openings being closed.

The wooden cover of each hive was removed and replaced with a chaff cushion 3 inches thick, the latter placed on the propolis quilt, and lapping over the sides of the hive; two layers of paper were then placed on the top of the cushion and a second cushion added, with the top of the outside box over it. The bees were put into winter quarters on November 18, 1902. No sound could be heard from those colonies all winter, up to March 10, when a slight hum was perceptible. On March 20, 1903, the first bees made their appearance; there were many dead bees at the entrance of the hives. On March 21, the outside cases were removed, leaving the paper and one chaff cushion on during the cold spring. Upon examination one colony was found to be in fairly good condition, the other very poor, with many dead bees on the bottom board. A few days afterward the latter was found to be deserted. The frames in both cases were all dry and clean and had abundance of honey to carry them through from November to the clover bloom. Weight, when put into winter quarters, 53½ lbs. each; in spring, 37¼ pounds each. Owing to the cool, backward spring, the surviving colony did not build up until May 1, when warmer weather set in; the bees at once began gathering pollen and built up very rapidly. The colony was in excellent condition for a honey flow, but during May and the early part of June the weather was very dry and warm, keeping all bloom backward; the bees, therefore, made but little surplus honey.

This experiment is to be tried again this winter.

EXPERIMENTS TO TEST WHETHER DAMPNESS OR MOISTURE WOULD BE INJURIOUS TO BEES IN THEIR WINTER QUARTERS.

Three colonies were selected for this experiment, all of about equal strength, and all in Langstroth hives, weighing on an average 55½ pounds each. The wooden covers were removed from the hives and replaced with propolis quilts; the bottom of each hive was loosened from the brood chamber and a block two inches square was placed at each corner between the bottom board and the brood chamber, insuring free ventilation from the bottom of each hive. Four pails of water were then put on a table in such a way that the three hives were set resting on the edge of the pails, allowing the full surface of water to be exposed. The cellar was kept at a very even temperature of 42 to 48 degrees, and was well ventilated during the whole winter. The bees could be seen hanging below this frame in a quiet cluster, and there were very few dead bees on the bottom board, and no signs of dysentery.

On March 22, the day being fine, the colonies were removed to the bee yard, where all began flying at once. Average weight of the three colonies when set on their summer stands, 43¼ pounds each. From March 22 to May 1, the weather, although bright, was cool and windy, and very little flying took place. After May 1, the weather became considerably warmer, and the bees began building up rapidly. They were in excellent condition by May 24.

EXPERIMENT IN FEEDING BEES IN THEIR WINTER QUARTERS.

Many letters have been received from people who have only a few colonies of bees, stating that when carrying their bees into winter quarters they had discovered there did not seem to be a sufficient store of honey in the hive to carry the bees through the winter. To gain information as to the best method of overcoming this difficulty the following experiment was tried with six strong colonies of bees:—

Four frames of sealed honey were taken from each of the six hives, leaving the cluster on the four remaining frames. The four frames were left in the centre of the hive with a division board at each side, and some light packing placed between the division boards and the sides of the hives. The wooden covers were removed and replaced by large propolis quilts made of heavy canvas. Over the top of the propolis quilt extra packing was added to keep in the heat, absorb moisture and prevent draughts or upward ventilation. The bottom boards were left on as they came from the bee yard, leaving the entrance wide open. The experiment was made as follows:—

1. Two colonies received maple sugar of the best quality.
2. Two colonies received partly filled sections of honey.
3. Two colonies received candied honey and sugar.

Each colony when put on this test, weighed 31 pounds, and each was given 5 pounds of its respective food to start with. The experiment lasted from November 18, 1902, to March 22, 1903. The two colonies fed on maple sugar consumed 11½ pounds each, they were examined every two weeks and water added to the sugar through holes in the tops of the cakes, keeping it soft and moist.

The two colonies fed on partly filled sections of honey, consumed during the same time 14¾ pounds each. There was for several reasons considerable waste in this test; consequently if partly filled sections could be sold even at a reduced price it would be advisable to sell them instead of feeding back.

The two colonies that were given candied honey and sugar consumed 10¾ pounds each. The candied honey was moistened from time to time, which made it easier for the bees to suck it up. Candied honey is made as follows: Take good thick clover honey, and heat (not boil) it until it becomes very thin; then stir in it fine granulated sugar. When the honey has dissolved the sugar, pour it into another vessel, and, when it has cooled sufficiently, thoroughly knead it with the hands. The kneading makes it more pliable and soft, so that it can take up more sugar. The kneading operation, with the adding of fine sugar, should be continued until the dough is so stiff as to be quite hard to work. It should then be allowed to stand for a day or two, and, if at the end of that time it is so soft as to run or to be sticky, a little more sugar should be kneaded in, so that it may be cut into cakes of a convenient size. These cakes are to be placed on top of the frames in such a way that the bees can get at them easily.

The colonies in all the three tests came through in excellent condition. Any one of the three methods may be safely followed, but I would strongly recommend examining and weighing all colonies the first week in September. At that time every colony should have a good laying queen, and should weigh over 50 pounds. In seasons when there is no autumn flow of honey, all colonies in Langstroth hives weighing less than 50 pounds in September should be fed up to that weight at least. The best method for getting colonies up to the required weight is, when the extracting takes place, to save several full well-sealed combs, then remove some of the light ones out of the hives and replace them with the heavier full frames. If no honey is available, feed sugar

syrup. This plan is rather a tedious one and great care must be taken not to daub the hives or appliances, as robbing at this season of the year is very easily started and very hard to stop.

If the colonies that are short of stores are weak or feeble in number of bees, they should then be fed with syrup. In order to provide for them, feed the strongest colonies you have, for instance, by putting in their hives extra frames and feeding the syrup in a Miller feeder. A good strong colony will take down 10 to 15 pounds in a warm night. Continue the feeding until you have sufficient frames well sealed to make up the required weight. The full frames are then removed and given to the weak colonies that are short of stores; by this method there will be very much less danger of robbing, as the strong colonies are well able to look after themselves.

Sugar syrup may be made as follows: Use the best grade of granulated sugar, two parts to one of water by weight. The water should first be brought to a boil, then the pan or vessel set back on the stove so that the boiling will not continue but the water be kept sufficiently hot to dissolve all the sugar. The sugar should be poured in slowly and thoroughly stirred until all is dissolved. The syrup should then be fed in a lukewarm condition..

Foul Brood.

Much attention has been drawn of late to this most destructive disease of bees, which affects particularly the larvæ or brood, causing them to die, mostly at the age of six to nine days. The disease is spread by bees feeding their larvæ with infected food, and is carried to new colonies by bees robbing diseased colonies. It is thought advisable to publish in this report the McEvoy method of detecting the disease and stamping it out when found in an apiary. With reference to this method of treatment of foul brood we have much pleasure in quoting the following from Wisconsin Beekeeping, Bulletin No. 2, 1902, by N. E. France, State Inspector of Apiaries.

'In Wisconsin I have tried many methods of treatment and cured some cases with each method, but the one that never fails, if carefully followed, and that commends itself, is the McEvoy treatment. It has cured foul brood by the wholesale, thousands of cases.' Mr. McEvoy decribes his method as follows :—

The McEvoy Treatment.

How to detect foul brood.—When any dead brood is noticed in a hive, a sure way to ascertain whether the cause of death is the disease known as foul brood, is to put the head of a pin into a cell of a comb and draw it out; if the matter contained in the cell adheres to the pin's head and can be stretched about three-fourths of an inch, it is undoubtedly a case of foul brood. But every bee-keeper should be able to recognize the disease at a glance without having to use a pin, as above said; he should learn to know the stain mark of foul brood when he sees it. The manner of proceeding to examine an apiary in which foul brood is suspected, is as follows:

Before opening any of the hives give every hive in the vicinity a little smoke at the entrance. This will check the bees for a time from coming from other colonies to disturb you when you have a hive open to examine the combs. After taking a comb out to examine it, turn your back to the sun, and, holding the comb in a slanting position, let the light fall on the lower side and bottom of the cells; look there for the dark scales left in the cells and formed from the dried up, decayed bodies of the dead larvæ. Another sign of the presence of foul brood is that several of the cappings have a small hole in them, but this also appears in the case of cells containing brood killed by other causes than this disease.

[Mr. Charles O. Jones, of Missisquoi, Que., describes the symptoms of foul brood as follows in the Montreal 'Weekly Star' :—

'Of the diseases affecting the brood, the most serious is foul brood, which has appeared in some localities in Ontario in a virulent form, but is being successfully

combated. The symptoms of this disease are not easily mistaken by one who is at all familiar with it. The brood hatches unevenly and the cappings have a shrunken appearance, and many of them are perforated as if the bees had begun uncapping the brood. The dead brood will be found adhering to the side (lower side) of the cell, and of a brownish colour. On inserting a small stick, the decomposed brood will adhere, and when withdrawn three-fourths of an inch, will still cling to the stick. Beside this "ropiness," the dead brood has a distinct odour very much like old glue. If the disease has developed sufficiently, this odour may be detected on removing the covering from the bees. These two last symptoms are peculiar to foul brood, and if present, are considered a certain indication of infection.']

HOW TO CURE INFECTED APIARIES.

Every infected apiary should be treated according to the condition in which it is found, and at the same time not only to stamp out the disease, but also so as to induce considerable increase in the colonies, and end by having every colony in first-class condition. I may therefore first explain how I proceed. The best time for this work is while the bees are gathering freely during the honey season.

For this, taking two hives at a time, I shake off the bees from them with one of the queens, and give them a clean hive with foundation starters, leaving in the two original hives one queen and only about a quart of bees to take care of the brood still unhatched in those two hives. I now remove the bottom of one hive and the top of the other, and place the first on the top of the second, so that the bees may unite and, as the young bees hatch out, form one strong colony. By the time that most of the brood is hatched I have from the two colonies, when united, one large swarm of young vigorous bees. This swarm must then be shaken into a fresh clean hive with foundation starters.

I have now two first-class colonies, each containing a queen, one from the bees first shaken out of the two original infected hives, and another from the brood left in the original hives with a queen and a small number of bees to take care of it. Both of these colonies must now be treated to destroy the disease. All handling of diseased colonies, especially during warm days should be done in the evening, when no bees are flying. This will prevent robbing, and also will prevent bees from diseased colonies mixing with those from sound colonies, going into their hives with them. Again, by doing the work in the evening, it gives bees which have been treated a chance to settle and quiet down before the morning.

[Mr. Jones, of Missisquoi, explains the same treatment as follows:—

'The cure, although simple, requires great care to carry it out successfully. A clean hive containing frames with starters of foundation, should be placed on the old stand after removing the affected hive. Remove the combs from the affected colony, and shake the bees in front of the clean hive into which they will run. This should be done at nightfall, when the bees are all at home, and then there will be no danger of robbers getting at any of the tainted honey. Leave the bees in the new hive for at least four or five days, by which time they will have used all the honey they carried with them in comb-building, when you can remove the starters to melt into wax, replacing them with frames filled with sheets of foundation, and your cure is effected. I would advise burning the combs and honey removed from the hive and thoroughly disinfecting the hive by scalding before using again.

'Some authorities advocate caging the queen for ten days or so, to prevent brood rearing until all danger of infection has passed, but I consider this only as an extreme precautionary measure; in fact, hardly necessary.']

Treatment during the Honey Season.—When the bees are gathering freely, remove the combs from the hive in the evening, replacing them by frames with comb foundation starters, as said before; then shake the bees from the combs into a clean hive and let them build comb for four days. By that time they will have made the starters into combs, and will have stored in these the infected honey which they brought from the

old combs. On the fourth day, in the evening, replace those combs containing the infected honey with full sheets of fresh comb foundation, and the cure will thus be complete. By this method of treatment, all the infected honey is removed before the full sheets of foundation are used.

When only a few cells are found with foul brood, after shaking off the bees for treatment, two hives may be filled with the combs containing the brood; then place these two hives on top of each other, as explained before, keeping them shaded from the sun until most of the brood is hatched. Then, in the evening, shake the bees from both hives into another single hive and give them frames with comb foundation starters. Let them build comb for four days, as above said, after which, in the evening, take out the new comb and give the bees comb foundation to work out to complete the cure. If the diseased colonies are weak in bees, the bees of two, three or four should be put together, so as to have a strong colony to start the cure with, as it does not pay to spend time over weak colonies.

When bees are not gathering honey.—An infected apiary can be cured of foul brood by removing the infected combs in the evenings and giving the bees frames with comb foundation starters on. Then, also in the evenings, feed the bees plenty of sugar syrup; they will draw out the foundation and store the infected honey which they took with them from the old combs. On the fourth evening, replace the new combs made out of the starters by frames with full sheets of comb foundation, and feed plenty of sugar syrup every evening until all the colonies are in first-class order. The sugar syrup should be made of granulated sugar, using one pound of water to every two pounds of sugar, and bringing it to a boil.

Treatment after all honey gathering is over.—When the disease is discovered in a few good colonies after the honey season is finished, the best plan is to leave them until an evening in October. Then take every comb out of the diseased colonies, replacing them by six combs of all-sealed or capped stores from sound colonies. Place a division board on either side of these all-capped combs. These colonies will thus be in perfect condition for wintering, and the disease will at the same time be stamped out; for, as there are no empty cells, the bees must have kept the infected honey which they took out of the old combs, until it was consumed, as they could not find a place in the all-capped combs to put it.

If there is a scarcity of all-capped combs from the sound colonies, as many as are required can be secured by putting Miller feeders on sound colonies in the evenings in September and feeding the bees all the sugar syrup they can be made to take; then, in October, each of these fed colonies can spare the two outside combs, which will be perfectly capped all over down to the bottom of the frames. These all-capped combs will provide plenty of good stores to carry out this autumn method of treatment.

All the old infested brood combs which have been removed from the hives, must be burned or made into wax, as well as all the combs made on the starters by the bees during the four days of the treatment.

As to the infected honey, I have always been opposed to having it treated and then fed to bees, for fear that the treatment may not be thorough enough. My recommendation is to bury it in the ground, as well as all the refuse from the honey extracted. This applies also, of course, to the honey stored up in the combs during the four days of the treatment.—W. McEvoy.

Treatment of the Hives and Frames.—In Mr. McEvoy's treatment of foul brood, there appears to be a danger that the hives themselves in some of their parts might be tainted with germs of the disease. We would, therefore, strongly recommend to disinfect the hives and the frames that have contained foul brood, by a thorough scalding. This operation is very simple; and, in view of the great losses that have been occasioned by foul brood, it is important to neglect no means to secure success in stamping out the infection.

John Fixter.

DIVISION OF BOTANY

FODDER CROPS.

The season of 1903 was not a good one for the production of heavy crops of fodder of any kind. In the East an exceptionally prolonged drought prevented grass and clover from starting well, and although, when rains came, these crops picked up in a surprising manner, still the yields were below the average in most places. A cool, damp autumn prevented corn from maturing and made it difficult to cure all hay crops.

Among various fodder plants which have been grown on the experimental plots at the Central Experimental Farm, one which has lately received much attention is Sainfoin *(Onobrychis sativa,* DC.). This beautiful plant, which may be known at once by its pinnate leaves and large cones of rose pink flowers on slender stems, is allied to the clovers, and, as a rule, is spoken of as a clover in the same way as Alfalfa or Lucerne is. It was noticed on the experimental plots that the flowers of this plant were extremely attractive to bees, and it is also a producer of good fodder, suitable for all stock. It is not as heavy a cropper as Alfalfa, but like that is a persistent perennial which roots deeply and in localities which suit it, produces heavy crops of hay.

The following notes on the cultivation of this plant have been prepared mainly by Mr. John Fixter, the farm foreman at the Central Experimental Farm.

SAINFOIN.

This clover has attracted much attention on the Central Experimental Farm, both as a fodder plant and also as a honey producer. In its cultivation and manner of growth it resembles alfalfa, but it is slightly finer and grows thicker in the bottom, having a more decided stooling habit, which makes it better for pasture. It is specially liked by sheep. The soil best suited to the growth of this plant seems to be a deep rather dry loam, containing a fair proportion of lime with good natural drainage. It will do well upon almost any soil that is well drained, provided it gets a good start. Heavy clay and light sandy soils both produce excellent crops of sainfoin, but on the latter it naturally requires generous manuring. It should never be sown on land likely to be covered with water at any season of the year. The amount of seed sown under ordinary conditions is about 20 lbs. per acre. Great care should be taken to secure new and plump seed; the hulled seed is preferable when it can be obtained, as it is easier to sow and germinates more quickly. A good seed bed is of great importance, and one of the best methods for preparing this, and also at the same time clearing the land of weeds such as quack grass and thistles, is to cultivate it with a firm-footed cultivator. If the field has been in meadow or grain, do not plough, but simply cultivate and harrow; first cultivate as shallow as possible, then pass the heavy iron harrows at a good sharp walk across the first cultivating. This operation will break up the sod or stubble very fine and leave it on the surface to dry out. The second cultivating should be in the opposite direction to the first, and likewise the harrowing. By this operation two-thirds of the sod will be loosened from its roots. It usually requires about four cultivations and four harrowings to make a perfect job. All this work must be done on fine sunny days, and the sooner after harvest the better. The cul-

tivating and harrowing must be gauged by the growth. If possible, every leaf must be cut off and kept out of sight, and all vegetation brought to the surface to be dried by the sun. This dead but valuable material may, during the autumn, be ploughed under to decay and add to the fertility of the soil. By the next spring this land should be in perfect condition for sowing. The best time to sow is as soon as the ground can be got ready in spring; the seed will then germinate quickly. As sainfoin is a quick-growing and deep-rooting plant, the roots keep going down into the moist earth so that dry weather will not have much effect upon it. If sown with a nurse crop, oats, wheat or barley may be used, but the latter is preferable, as it can be harvested earliest. Not more than half the ordinary amount of grain should be sown per acre with this clover, and better results are usually obtained by sowing it alone. It may be sown broadcast, then harrowed in and rolled so as to render the surface smooth, or it may be sown with the ordinary grain drill with grass seed attachment. The seed should be dropped in front of the drill and the land should afterwards be rolled. The small seeds will thus be covered, and, the surface being smooth, the young plants will come up quickly and regularly. For this crop land may be prepared by late summer-fallowing, or, what is even better, the seeding may follow a hoed crop; but, whatever the preparation of the land, it must be clean, and, as the seeds are small, it is essential to have it in a good state of tilth.

This plant has been grown on the experimental plots at the Central Experimental Farm for several years. The oldest plot now living has been standing for seven years, a second plot for two years, and the third plot was sown in the spring of 1903. The plot which has been growing for seven years is now thin and will soon be ploughed down. It would probably be the most economical plan to plough down this clover after three years and resow. As is well known, clovers of all kinds are the most valuable plants which can be grown and ploughed down as fertilizers, and the benefit of ploughing under this clover would more than pay for the resowing.

The Botanist's records of the experimental plots show that Sainfoin sown May 14, came into bloom on August 12 of the same year, was cut for hay on August 25, and gave a yield per acre of 1 ton 1,700 lbs. of cured hay. The second growth of the first year should be allowed to stand over for the winter as a protection to the roots, In the second year the plants came into bloom on June 1st and lasted up till the 24th of that month, when the plot was cut for hay. These dates might have been extended, had the plants been grown merely for honey; but, as they were at that time in the best condition for hay, they were cut for that purpose. If the crop had been left to stand longer, the hay would have been too woody. The yield of this first cutting was 2 tons 200 lbs. of cured hay per acre—a rather small crop, due to the excessive drought, which lasted up till June 12. The second bloom was on July 27, and lasted until August 17, when it was again cut for hay, giving 2 tons 1,400 lbs. of cured hay, or a total yield for the year of 4 tons 1,600 lbs. A third crop, which will provide some pasture, is allowed to remain on the ground for the winter, or in very favourable seasons might be again cut before winter, although this is not advisable.

From what we have seen of this clover, it is believed that farmers and bee-keepers would find it profitable to grow it.

HAY AND PASTURE MIXTURES.

In the last annual report the results of growing several mixtures of grasses and clovers were published. These experiments were again observed during the past season, and the yields given herewith are from the same plots which were sown in 1901. Last season should have been the large crop from these plots; but, unfortunately, the yields were very much lessened by the exceptionally dry weather which prevailed in spring at the time when meadows most require copious moisture. The yields for 1903 are given, together with those of the previous year, for comparison. It will be seen that several of these mixtures give heavy yields of excellent hay, and all of them are worthy of the consideration of the farmers of Canada.

Number.	Mixtures Sown May 4, 1901.				Cured Hay, per Acre.							
					1903.				Total.			
	Grasses.		Clovers.		July 14.		Sept. 30.		1903.		1902.	
		Lbs.		Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Timothy Meadow Fescue Orchard Grass Kentucky Blue Red Top	6 4 2 1 1	Alfalfa Alsike Mammoth Red Common Red White Dutch	2 2 1 1 2	2	1,160	1	1,360	4	520	4	40
2	Meadow Fescue Timothy Canadian Blue Orchard Grass Red Top	6 3 2 3 3	Alfalfa Alsike White Dutch	4 1 1	2	720	1	840	3	1,560	4	660
3	Timothy Awnless Brome Orchard Grass	5 4 2	Alfalfa Alsike	6 3	2	1,210	1	1,560	4	770	5	120
4	Meadow Fescue Orchard Grass Kentucky Blue	6 2 1	Common Red Alfalfa White Dutch	4 3 1	2	640	1	1,680	4	320	5	1,520
5	Timothy Upright Brome	6 4	Alfalfa Mammoth Red	6 4	2	1,320	1	1,520	4	840	4	960
6	Timothy	10	Common Red	6	1	1,680		1,200	2	880	4	760
7	Timothy	10	Mammoth Red	6	1	520		1,000	1	1,520	3	1,200
8	Orchard Grass	18	Alsike	5	1	840		1,240	2	080	2	1,200
9	Orchard Grass	18	Common Red	8	1	1,800		1,800	2	1,600	3	1,280
10	Meadow Fescue	20	Common Red	8	1	1,320		1,360	2	680	3	40
11	Timothy	12	Mammoth Red	8	2	280		1,120	2	1,400	3	1,760
12	Timothy	12	Common Red	8	2	80		1,840	2	1,920	3	20
13	Timothy Awnless Brome	5 10	Common Red Mammoth Red	5 5	1	1,920		1,920	2	1,840	4	300
14	Awnless Brome	25	....		1	1,360	....		1	1,360	3	1,020
15	Awnless Brome	15	Common Red	8	2	40	1	320	3	360	4	760
16	Timothy	8	Mammoth Red	8	2	480	1	680	3	1,160	3	340
17	Alfalfa	15	(weight green, 8 tons 720 lbs.)		3	120	1	1,040	4	1,160	3	1,160

There has been a large correspondence carried on with farmers in all parts of Canada with regard to the best grasses to grow for hay and pasture, and also as to the best crops for late sowing in seasons when drought or other adverse conditions have interfered with the germination or development of corn and other fodder crops. In the drier districts of the West excellent results have been secured from sowing Alfalfa and Brome grass together, 12 to 15 lbs. of the former and 6 of the latter, or mixtures in varying proportions according to the requirements of the growers, of the small grains and some leguminous plant. The mixtures, which have given good satisfaction, are: Tares and oats, a bushel and a half of each, or Peas and oats, in the same proportion; Peas, wheat and oats, one bushel of each; or Peas, wheat and late barley. All of these give heavy crops of excellent hay. A valuable crop which is every day growing in favour, is Fodder Rape. This has been grown with much satisfaction in all parts of Canada. It is best sown alone, two pounds of seed to the acre in drills thirty inches apart, so as to allow of cultivation to destroy weeds and to hold in moisture when the seed has been sown late. Crops of rape are ready for cutting or feeding off in about sixty days after sowing. Two or three crops may be taken before winter sets in.

REPORT OF THE EXPERIMENTALIST.

(CHAS. E. SAUNDERS, B.A., Ph. D.)

Dr. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa

SIR,—I have the honour to submit herewith the first report of the work of this division, which has been in my charge since the commencement of the present year.

The work of cereal breeding occupied a large proportion of my time during the summer season, several weeks being given up almost exclusively to the cross-fertilising of wheat, oats, barley and peas; while the selection of fixed and desirable types from among the progeny of crosses made in previous years demanded considerable attention. The results of the season's work along these lines have been satisfactory.

The uniform tests of new and established varieties of cereals, field roots and fodder corn have been continued in much the same way as usual, and the results are here presented in tables similar to those which annually appeared in your own report during the long period in which this work was under your immediate supervision.

The prolonged drought of spring followed by the extremely wet weather in June proved very unfavourable for most of the early varieties of cereals, and also prevented other crops from giving very large returns; but on the whole the results of the season were fairly good.

The care of those parts of the ornamental grounds which have been assigned to this division occupied a portion of my time. The season was, as a whole, most favourable and flowers: the pansies, roses, pæonies and asters being particularly fine.

During the month of May much time was spent in the hybridising of apples and plums for the production of extremely hardy varieties suitable for the climate of the western prairie country. Thirty-four different crosses were made in apples, yielding 1,021 seeds; one cross was made in plums, yielding 38 seeds; and one cross was made between the plum and the sand cherry, yielding 2 seeds. In the autumn, during your absence in the North-west, a large amount of time was given to studying, comparing and describing the new hybrid apples which were bearing fruit—many of them for the first time.

Considerable time was spent during the winter months in establishing a reference collection of mounted specimens of the heads of cereals. The specimens are attractively and conveniently arranged in a series of shallow cardboard boxes filled with cotton batting and covered with glass. A set of small bottles containing the threshed grain is also being prepared. These collections have already proved very useful for purposes of description, identification, &c.

I acknowledge with pleasure my indebtedness to Mr. George Fixter, whose accurate records of the experimental plots relieved me of a large amount of labour, and to Mr. James Taggart, whose work in the ornamental grounds displayed much care and ability.

The following donations are thankfully acknowledged:—From the United States Department of Agriculture, samples of macaroni wheat, oats and millet; from Haage and Schmidt, Erfurt, flower seeds; from W. Atlee Burpee, Philadelphia, flower seeds; from J. MacGrady, Gatineau Point, seed of choice delphiniums; and from S. P. Hamilton, Bush Glen, samples of grain from India.

I have the honour to be, sir,
Your obedient servant,
CHAS. E. SAUNDERS,
Experimentalist.

CEREAL BREEDING.

This work falls naturally into two divisions, first, the foundation work of cross-fertilising, and second, the work of selection.

Cross-fertilising.—This work in cereals was begun on June 10, and continued until July 14, a considerable proportion of the time being devoted to it. A description of the actual process of cross-fertilising need not be repeated here, as it has been already published in the annual report for the Experimental Farms for 1896 (page 21) and is necessarily of a somewhat technical nature. On account of the great importance and difficulty of this kind of work it is done entirely by the Experimentalist himself, no assistant being employed.

The weather was very favourable and the number of seeds obtained was large. About seventy different crosses between cereals were successfully carried out, producing over 550 kernels. Most of the crosses were made between wheat and wheat, with a view to combining, as far as possible, the extremely desirable qualities of productiveness and earliness with the ability to produce flour of great strength and good colour. The varieties used as parents included some of the most promising of the cross-bred sorts produced at the Experimental Farms, as well as older and standard kinds. Over four hundred kernels of wheat were thus obtained. A much smaller amount of work was done in the crossing of oats, barley and peas. A few mixed crosses, such as between wheat and emmer, were also successfully attempted.

Selection.—Each kernel produced by cross-fertilising generally gives rise, in the course of three or four years, to a number of distinct varieties. So that the foundation work of crossing needs to be followed by persistent and rigid selection for several years afterwards, until the various types are fixed, in order to obtain the best possible results from the cross. Selection, as sometimes practised, without previous crossing, is an easy but comparatively unprofitable process, and has little relation to the work here described, inasmuch as those varieties of cereals which have been in cultivation for long periods show little or no tendency to vary until after they have been crossed with some other sort.

Over one hundred new varieties of wheat were grown this season in very small plots. The best types found among these are being selected to sow again next year. These sorts are the progeny of some crosses (made by the writer in 1900) between Red Fife and some of the macaroni wheats and between Colorado and Common Emmer. Most of the types produced from these crosses are not yet fixed. As an instance of extreme variation it may be mentioned that nearly forty varieties have already arisen among the progeny of one of the original (cross-fertilised) seeds.

The tendency of cross-bred cereals to vary for a number of years after their production is also seen in the case of those varieties produced at the Experimental Farm in the earlier years of its history. Some of these, such as Preston wheat, Stanley wheat, &c., have already attracted a good deal of attention. It is found, however, that each of these, as now grown, is not of one fixed type, but contains a small proportion of kernels which appear foreign. Efforts are being made to improve these varieties by reducing each of them to one type as quickly as possible with the intention of supplying only such improved strains as soon as a sufficient quantity of the seed is available. Descriptions of the varieties will be published when the types are decided upon and fixed.

Attention is also being paid to the elimination of the false kernels and undesirable types which are often found in varieties of cereals obtained from commercial and other sources.

Descriptions of five of the cross-bred varieties of wheat produced at the Experimental Farms are here given.

Preston.—Parentage, Ladoga (female) crossed with Red Fife (male). Kernels red, above medium size. Heads bearded, usually about 3⅜ inches long (at Ottawa). Chaff yellowish (that is, 'white'), smooth. Straw stiff, usually about 44 inches long (at Ottawa). Ripens early (about six days before Red Fife, at Ottawa). Gives a very large yield.

Stanley.—Parentage, Ladoga (female) crossed with Red Fife (male). Kernels red, above medium size. Heads beardless, usually about 3⅝ inches long. Chaff red, smooth. Straw stiff, usually about 44 inches long. Ripens early (about six days before Red Fife). Gives a good yield.

Huron.—Parentage, Ladoga (female) crossed with White Fife (male). Kernels red, above medium size. Heads bearded, usually about 3¾ inches long. Chaff red, smooth. Straw stiff, usually about 45 inches long. Ripens rather early (about 3 days before Red Fife). Gives a large yield.

Percy.—Parentage, Ladoga (female) crossed with White Fife (male). Kernels red, above medium size. Heads beardless, usually about 4 inches long. Chaff yellowish, smooth. Straw stiff, usually about 47 inches long. Ripens early (about 5 days before Red Fife). Gives a good yield.

Laurel.—Parentage, Red Fife (female), crossed with Gehun (male). Kernels red, above medium size. Heads beardless, usually about 4 inches long. Chaff yellowish, smooth. Straw stiff, usually about 49 inches long. Ripens with Red Fife. Gives a large yield.

UNIFORM TEST PLOTS OF CEREALS, FIELD ROOTS AND FODDER CORN.

The standard and new varieties of cereals which are obtainable commercially are annually grown in plots of one-fortieth of an acre, along with the cross-bred sorts produced at the Farms and a number of other varieties obtained from various sources. The field roots and fodder corn are grown in similar plots, and the yield per acre is estimated from the crop obtained from two rows, each 33 feet long. The object of these tests is to determine the relative productiveness, earliness, &c., of the different varieties. Those which for a series of years are found to be distinctly inferior are rejected, and strong efforts are made to keep the lists within as small bounds as possible without omitting anything which may ultimately prove of value.

The number of plots grown during the past season was as follows :—Spring wheat 112; macaroni wheat, 16; winter wheat, 20; emmer and spelt, 12; oats, 81; six-row barley, 33; two-row barley, 25; pease, 44; rye, 1; soja beans, 2; horse beans, 2; millet, 6; turnips, 42; mangels, 32; carrots, 22; sugar beets, 16, and Indian corn 37; making a total of 503 plots. These represent about 430 varieties, duplicate plots having been necessary, for special reasons, in some cases. Nearly all of these varieties will be found reported on in the tables following, only a few of those which are manifestly inferior having been dropped. Quite a number of those mentioned in the last annual report of the Experimental Farms were not sown this season inasmuch as they had shown a distinct lack of productiveness for a series of years.

Some of the cross-bred sorts produced at this Farm have also been withdrawn for more rigid selection, but will probably be introduced again in the course of a few years.

PREPARATION OF LAND FOR THE UNIFORM TEST PLOTS.

The system of cultivation adopted for the land devoted to the experimental plots is somewhat different from that which is generally considered advisable in ordinary

farming. The land used for the plots consists of three separate fields. Each field receives every third year a dressing of fresh barn-yard manure at the rate of about 12 tons per acre. This is placed on the frozen ground in winter in small heaps of about one-third of a cart-load each, and is spread and ploughed under in spring. This field is then used for roots, fodder corn and other hoed crops. In the autumn, after the harvest is over, the land is ploughed about seven inches deep, and is left in that condition until the following spring when it is cultivated twice with a two-horse cultivator and harrowed twice with a smoothing harrow. Cereals are then sown. After the grain is harvested the land is ploughed about three or four inches deep, to start the shed grain and any weed seeds present, and is again ploughed a few weeks later about seven inches deep. In the following spring it is prepared as before and cereals are again sown. It is not, however, the practice to sow the same cereal twice in succession on the same piece of land.

In this way a three-year rotation is kept up which is found to be very satisfactory, the quantity of manure applied maintaining fully and even increasing the fertility of the soil in spite of the great demands made upon it.

WEATHER.

The weather was quite unusual during the past season : an almost unbroken drought from April 4 to June 11, being followed by a long period of very wet weather. The early varieties of grain suffered most, as they were so far advanced when the rains came that they did not recuperate to the same extent as the later ripening sorts. The earliest varieties of wheat suffered particularly, and the yields are therefore in some cases remarkably low. The wet weather proved very favourable for the spread of rust, which materially diminished the grain crop in some instances. In the case of the field roots the principal effect of the drought was to delay the germination of a large proportion of the seed of both sowings until about the middle of June, when the dormant seed of both sowings germinated together.

In such a season as this it will be readily understood that very slight differences in the composition, drainage, &c., of the soil assumed unusual importance.

MOST PRODUCTIVE VARIETIES OF CEREALS.

In order to present in as concise a form as possible the most important conclusions to be drawn from the extensive series of tests made at this Farm, very short lists of varieties recommended for cultivation on account of their large yield have been added. No variety is recommended until it has been grown for at least five years, and the conclusions drawn are taken from the average returns for a series of five years or more. The greatest care is exercised to make these comparisons entirely trustworthy, and it is hoped that these short lists will be found useful for reference by farmers who wish to grow only the most productive sorts.

EARLIEST VARIETIES OF CEREALS.

Brief lists of the earliest varieties of cereals are given in the hope that they may prove useful to farmers in the northern parts of Ontario and Quebec, as well as in other sections of the Dominion where the seasons are comparatively short.

SPRING WHEAT.

Three additional varieties of spring wheat appear in the list this year.

Marvel, which was obtained from the United States, is a beardless variety with downy chaff, and very closely resembles Blue Stem.

Blue Stem was added to the plots this year chiefly for the sake of comparison with Hayne's Selected Blue Stem, which has been further selected at the Minnesota Experiment Station, and is often referred to as Minnesota No. 169.

Oregon Club is a beardless variety obtained from Oregon. It is not a promising sort for this climate.

All the plots of spring wheat were sown on April 14 or 15, except Marvel, which was sown April 16. The seed was used at the rate of 1½ bushels to the acre. The yields given are calculated from plots of one-fortieth of an acre, except in the case of Huron and Marvel, where one-eightieth of an acre was used.

The yield per acre is expressed in 'bushels' of 60 pounds.

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		No. of Days maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
					Inches.		Inches.	Bush.	Lbs.	Lbs.	
1	Advance*	Aug.	7	115	47 to 49	Stiff	2¾ to 3¼	34	40	59½	Slightly.
2	Nixon*	"	10	117	46 " 48	"	3½ " 4	33	20	60	"
3	Australian I	"	12	119	40 " 42	Medium	3 " 3½	32	40	58	Considerably.
4	Benton*	"	5	113	43 " 45	"	3 " 3½	30	20	58½	"
5	McKendry's Fife (Minn. 181)	"	16	124	43 " 45	Stiff	3½ " 4¼	30	20	59	Slightly.
6	Preston*	"	5	113	35 " 37	Medium	3¼ " 3¾	29	40	59	"
7	Minnesota No. 163	"	16	124	42 " 44	Stiff	3 " 3¾	29	20	59	"
8	Wellman's Fife	"	14	122	44 " 46	"	3¼ " 4	29	..	60	"
9	Marvel	"	16	122	42 " 44	"	3¾ " 4½	28	40	59½	"
10	Robin's Rust Proof	"	10	118	40 " 42	"	2¾ " 3¼	28	20	60	"
11	Australian F	"	12	119	38 " 40	"	3 " 3¾	28	20	60¼	Considerably.
12	Monarch	"	15	123	40 " 42	"	3¾ " 4½	28	..	58	Slightly.
13	Florence*	"	4	111	43 " 45	"	2½ " 3¼	27	40	58½	Badly.
14	White Connell	"	14	122	43 " 45	"	3 " 3¾	27	20	59	Slightly.
15	Hungarian	"	5	113	41 " 43	Medium	3 " 3¾	27	20	59½	Considerably.
16	Orleans*	"	6	113	42 " 44	"	3 " 3¾	27	20	58½	"
17	Redpath*	"	15	122	43 " 45	Stiff	3¼ " 3¾	27	20	58½	Slightly.
18	White Fife	"	15	123	42 " 44	"	3¼ " 4	27	.	59½	"
19	White Russian	"	13	121	37 " 39	Medium	3¼ " 3¾	26	40	58	"
20	Byron*	July	31	108	39 " 41	"	2¾ " 3¼	26	20	59	Badly.
21	Huron*	Aug.	10	118	40 " 42	"	3 " 3¾	26	..	60½	Considerably.
22	Pringle's Champlain	"	9	117	44 " 46	"	3¾ " 4½	26	..	58	Slightly.
23	Australian C	"	12	119	42 " 44	Stiff	3¼ " 3¾	26	..	58¾	"
24	Australian D	"	5	112	42 " 44	"	3 " 3¾	26	..	60¼	Considerably.
25	Red Fife	"	15	123	41 " 43	"	3¼ " 4	25	40	59½	Slightly.
26	Herisson Bearded	"	6	114	35 " 37	Medium	1½ " 2	25	40	57	Considerably.
27	Dawson*	"	14	121	44 " 46	Stiff	3½ " 4¼	25	40	59	Slightly.
28	Norval*	"	10	118	37 " 39	Medium	2½ " 3¼	25	40	58½	Considerably.
29	Essex*	"	13	121	45 " 47	Stiff	3 " 3¾	25	20	59	"
30	Harper*	"	8	115	38 " 40	Medium	2¾ " 3¼	25	20	56	Badly.
31	Clyde*	"	10	118	40 " 42	Stiff	3 " 3½	25	..	58½	Slightly.
32	Blue Stem	"	15	122	46 " 48	"	3¾ " 4¼	25	..	60	"
33	Australian No. 1	"	12	119	38 " 40	Medium	3 " 3½	24	40	58½	Considerably.
34	Gehun	July	27	103	39 " 41	Weak	2 " 2½	24	20	57½	"
35	Oxbow*	Aug.	8	115	40 " 42	"	2½ " 3	24	20	59	Badly.
36	Haynes' Blue Stem (Minn. 169)	"	17	125	46 " 48	Stiff	3½ " 4¼	24	20	59½	Slightly.
37	Australian No. 19	"	15	123	41 " 43	"	2¾ " 3¼	24	20	58½	"
38	Australian No. 23	"	14	122	41 " 43	"	3¼ " 4	24	20	58	"
39	Weldon*	"	10	118	42 " 44	"	3 " 3¾	24	..	58½	"
40	Harold*	July	27	103	39 " 41	Weak	2¾ " 3¼	23	20	58	Badly.
41	Crown*	Aug.	10	118	42 " 44	Medium	2½ " 3	23	20	58½	Slightly.
42	Australian No. 27	"	13	121	46 " 48	Stiff	3 " 3¾	23	20	58¼	Considerably.
43	Australian No. 21	"	8	115	39 " 41	Medium	3 " 3¾	23	..	57½	Badly.

SPRING WHEAT—TEST OF VARIETIES—*Concluded.*

Number.	Name of Variety.	Date of Ripening.	No. of Days maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs.	
44	Australian H	Aug 16	123	44 to 46	Stiff......	3½ to 4¼	23	..	58½	Slightly.
45	Stanley*....................	" 1	109	39 " 41	"	3¼ " 4	22	40	60½	Considerably.
46	Blair*......................	" 7	115	38 " 40	Weak	3½ " 4	22	40	59½	"
47	Grant*......................	" 5	112	39 " 41	Stiff......	3¼ " 3¾	22	40	58	Slightly.
48	Countess*	July 31	108	39 " 41	Medium..	2¾ " 3¼	22	20	59	Considerably.
49	Australian No. 25...........	Aug. 13	121	40 " 42	Stiff......	3½ " 4	22	20	58	Slightly.
50	Australian No. 28...........	" 8	115	40 " 42	"	3 " 3½	22	20	61	"
51	Australian E................	" 12	119	45 " 47	"	3¼ " 4	22	20	58	Considerably.
52	Australian J....	" 4	111	41 " 43	"	3 " 3½	22	20	60	"
53	Colorado :..................	" 6	114	40 " 42	"	2¾ " 3¼	22	..	59½	Slightly.
54	Ebert*......................	July 28	104	44 " 46	Medium..	3 " 3½	22	..	60	Considerably.
55	Power's Fife (Minn. 149).....	Aug. 16	124	39 " 41	Stiff......	3 " 3¾	22	..	59½	Slightly.
56	Australian No. 11...........	" 16	123	46 " 48	"	3½ " 4¼	22	..	58	"
57	Red Fern....................	" 10	118	44 " 46	"	3½ " 4¼	21	40	60	"
58	Crawford*...................	July 31	108	37 " 39	"	2¾ " 3¼	21	40	59½	"
59	Bishop*.....	" 31	108	42 " 44	Medium..	2¾ " 3¼	21	40	60	Badly.
60	Angus*......................	Aug. 7	115	48 " 50	Stiff......	3¼ " 3¾	21	40	58½	"
61	Powell*.....................	" 5	112	39 " 41	"	2½ " 3¼	21	40	58	Considerably.
62	Cartier*....................	July 31	108	40 " 42	"	2½ " 3¼	21	20	60½	"
63	Laurel*.....................	Aug. 13	121	42 " 44	"	3½ " 4¼	21	..	59½	Slightly.
64	Boyle*......................	" 12	119	42 " 44	"	3 " 3¾	21	..	58	Considerably.
65	Australian No. 13.	" 15	123	39 " 41	"	2¾ " 3½	21	..	59	Slightly.
66	Rio Grande..................	" 16	124	46 " 48	"	3¼ " 4	20	40	58	"
67	Alpha*......................	" 10	118	37 " 39	Medium..	3 " 3½	20	20	59	Considerably.
68	Morley*	" 10	117	43 " 45	Stiff......	3¾ " 4½	20	20	57¾	Slightly.
69	Dawn*.......................	" 4	112	38 " 40	"	2¾ " 3½	20	20	59½	Considerably.
70	Australian No. 12...........	" 7	114	38 " 40	Weak	2½ " 3	20	20	58¼	"
71	Plumper*....................	" 6	114	36 " 38	Medium..	2¼ " 2¾	20	..	59½	"
72	Percy*......................	" 7	115	38 " 40	Stiff......	3¼ " 3¾	19	40	59	Slightly.
73	Hastings*....	" 5	113	38 " 40	Medium..	3 " 3¾	19	40	58¼	Considerably.
74	Fraser*.....................	July 28	105	39 " 41	" ..	2½ " 3¼	19	40	59¼	Badly.
75	Chester*....................	Aug. 8	116	39 " 41	" ..	3 " 3¾	19	20	58¾	"
76	Admiral*....................	" 8	116	44 " 46	Stiff......	3 " 3½	19	..	58	Considerably.
77	Japanese....................	July 29	106	37 " 39	"	2¼ " 2¾	19	..	59	"
78	Progress*...................	Aug. 6	114	40 " 42	"	2¾ " 3½	18	40	59¼	"
79	Vernon*.....................	" 10	118	38 " 40	"	2¾ " 3¼	18	40	58½	Slightly.
80	Australian No. 18.	" 15	122	46 " 48	"	3¼ " 4	18	40	60	"
81	Red Swedish.................	" 13	121	37 " 39	Weak	2½ " 3¼	18	20	59	"
82	Newdale*.......	" 7	114	38 " 40	Stiff......	3¼ " 4	18	20	59	"
83	Steinwedel..................	" 1	108	39 " 41	"	2¾ " 3¼	18	20	57½	Considerably.
84	Australian No. 10...........	" 14	122	34 " 36	"	2¼ " 3	18	..	58½	Slightly.
85	Markham*....................	" 10	117	40 " 42	"	3 " 3½	17	40	58	"
86	Australian No. 15...........	" 16	123	40 " 42	"	2¾ " 3½	17	40	61	"
87	Spence*...	July 28	104	40 " 42	Medium..	2½ " 3	17	..	59	Considerably.
88	Tracey*.....................	Aug. 13	120	46 " 48	Stiff......	3 " 3¾	16	40	59	Slightly.
89	Australian No. 9	" 1	109	34 " 36	Medium..	2¾ " 3¼	14	40	58½	Considerably.
90	Cassel*.....................	" 10	118	38 " 40	Stiff......	3 " 3¾	14	20	57½	Slightly.
91	Oregon Club.................	" 3	110	35 " 37	"	1¾ " 2¼	13	20	57	Badly.
92	Dayton*.....................	" 4	111	42 " 44	"	3 " 3¾	13	..	59	Considerably.
93	Early Riga*.................	July 28	105	38 " 40	"	2¾ " 3¼	10	..	56½	Badly.

* Cross-bred varieties produced at the Experimental Farms.

MOST PRODUCTIVE VARIETIES OF SPRING WHEAT.

Taking the average of the returns for a series of years, the varieties of spring wheat found to be the most productive at this Farm are Preston, Huron, Pringle's Champlain, Wellman's Fife and Hungarian. Preston stands at the head of the list for productiveness (macaroni wheats being excluded). Red Fife gives a distinctly smaller yield than Preston, but is slightly superior in value from a miller's point of view.

EARLIEST VARIETIES OF SPRING WHEAT.

The earliest varieties now grown at this Farm (as shown by the average of the records for several years) are Harold, Gehun, Early Riga, Fraser and Ebert. These ripen, as a rule nearly two weeks earlier than Red Fife, and about one week earlier than Preston. These earlier varieties are not yet available for general distribution, but their value for the production of flour is being investigated with a view to the propagation of the best variety, or varieties, for those parts of the country where earliness is of the greatest importance.

STUDY OF THE QUALITY OF VARIOUS KINDS OF WHEAT.

The value from a miller's point of view of the various sorts of wheat is so important a consideration that steps are being taken towards the testing of all the varieties grown on this Farm. A rough preliminary test of most of the important sorts of spring wheat has been made and valuable information has been gained, although the results must be regarded as suggestive rather than conclusive.

In the case of some of the most important varieties, where larger quantities of grain were available, actual milling tests have been obtained. The results of some of these tests will be found in the report of the Director for this year.

It is proposed to subject all the new varieties which may be produced at this Farm to a critical examination by the methods indicated, before sending them out for test elsewhere.

MACARONI WHEAT.

It has been thought best to publish the results of the comparative tests of varieties of macaroni wheat in a separate table, rather than in conjunction with the ordinary sorts of spring wheat. While it is possible to make good flour from some kinds of macaroni wheat, such flour is peculiar in its character and is generally unpopular. Furthermore, the extreme hardness of the kernels necessitates special care in the milling of these kinds of wheat. They are naturally, therefore, looked upon with disfavour by millers.

Farmers who grow any of these varieties should exercise the utmost care to prevent them from becoming mixed with the standard sorts used for flour making. Conversely, macaroni wheat in which kernels of other types of wheat are found is regarded as much less valuable for its special purpose.

Macaroni wheat appears to succeed best in rather dry climates, and can often be successfully grown on rather poor and sandy soil, where it is difficult to obtain a good yield of the better varieties of wheat.

Through the courtesy of the Department of Agriculture at Washington, U.S., the following new varieties of macaroni wheat were obtained this year and were tested in the uniform plots :—

Medeah (No. 7579) from Algeria.
Kahla (No. 7794) from Algeria.
Mahmoudi (No. 7792) from Algeria.
Mishriki (No. 7016) from Egypt.
Gejar (No. 7430) from Spain.
Girgeh (No. 7422) from Egypt.

Most of these gave fair yields, except Gejar and Girgeh, both of which proved entirely unsuitable for this climate.

The plots of macaroni wheat were all one-fortieth of an acre in extent. The seed was sown on April 14 and 15, at the rate of 1½ bushels to the acre.

The yield per acre is expressed in 'bushels' of 60 pounds.

MACARONI WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Rusted.
				In.		In.	Bush.	lbs.	Lbs.	
1	Yellow Gharnovka (Washington, No. 5642)........	Aug. 17..	124	44-46	Medium..	3¼-3¾	33	40	59¾	Slightly.
2	Gharnovka (Washington, No. 5646)	" 18..	125	40-42	" ..	2½-3¼	31	20	59	"
3	Beloturka (Washington, No. 5800)............	" 18..	125	45-47	" ..	2¼-3	31	20	58	"
4	Kubanka (Washington, No. 5639)........... ..	" 18..	125	41-43	" ..	2¼-2¾	29	..	61¼	"
5	Black Don (Washington, No. 5645).........	" 7..	114	40-42	" ..	2 -2¾	27	40	61	"
6	Roumanian.....	" 7..	115	40-42	Weak ...	2 -2½	27	..	61	Considerably.
7	Medeah..................	" 6..	113	41-43	Medium..	2 -2½	27	..	60½	"
8	Velvet Don (Washington, No. 5644)..............	" 11..	118	38-40	Stiff	2 -2¾	27	..	60	Slightly.
9	Kahla....................	" 12..	119	36-38	Weak	1¾-2¼	25	..	58	Considerably.
10	Mahmoudi	" 6..	113	36-38	"	1¾-2¼	23	20	57¾	Slightly.
11	Goose....................	" 7..	115	40-42	Medium..	2¼-2¾	19	..	58½	Badly.
12	Mishriki	" 5..	112	34-36	" ..	1¾-2¼	14	20	47½	"

WINTER WHEAT.

The plots of winter wheat were sown on September 6, 1902. The size of the plots was one-fortieth of an acre each; and the seed was used at the rate of 1¾ bushels to the acre.

The plots looked well when winter set in; but were found to be considerably injured when growth commenced in spring. The yield of all the varieties except Imperial Amber, Reliable, Egyptian Amber and American Bronze has been estimated from one-eightieth of an acre only, taking the better half of the plot in each case. The yield of the varieties above-mentioned has been calculated from the whole plot. Surprise, Red Velvet Chaff, Poole and Tasmania Red were so largely winter-killed that no accurate estimate of their yield could be made.

The yield per acre is expressed in 'bushels' of 60 pounds.

(Photo. by C. E. Saunders.)

Double rows of Cereals at Experimental Farm, Ottawa.

WINTER WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.	Weight per Measured Bushel after Cleaning.	Rusted.
				In.		In.	Bush. lbs.	Lbs.	
1	Turkey Red........	July 23..	320	37-39	Weak	3 -3½	45 20	62	Slightly.
2	Dawson's Golden Chaff...	" 21..	318	38-40	Stiff	2¾-3¼	41 20	63	"
3	Imperial Amber..........	" 19..	316	44-46	Medium..	3 -3½	39 20	62¾	"
4	Reliable.................	" 23..	320	48-50	" ..	3½-4¼	36 ..	62½	"
5	Egyptian Amber........	" 23..	320	38-40	Stiff	3 -3¾	35 20	62½	"
6	Early Red Clawson ...	" 19..	316	38-40	"	2¾-3¼	34 40	61½	"
7	Buda Pesth............ .	" 25..	322	40-42	Medium..	3 -3½	33 20	62½	"
8	Long Berry Red.........	" 19..	316	38-40	Stiff	3 -3½	33 20	62	"
9	Bonnell	" 23..	320	47-49	Medium..	3¼-3¾	33 20	62¼	"
10	Treadwell	" 22..	319	41-43	" ..	3 -3½	32 40	62	"
11	Jones' Winter Fife.....	" 22..	319	40-42	Stiff	3 -3½	32 ..	62½	"
12	Golden Cross	" 20..	317	37-39	"	2 -2½	32 ..	61	Considerably.
13	Gold Coin	" 22..	319	38-40	"	2¾-3¼	30 40	62	Slightly.
14	Pride of Illinois..........	" 20..	317	40-42	"	3½-4	30 40	62	"
15	American Bronze.........	" 22..	319	43-45	"	3¼-3¾	30 ..	62½	"
16	Velvet Chaff.............	" 18..	315	38-40	"	2¾-3¼	29 20	62	Considerably.

EMMER AND SPELT.

The different varieties of emmer and spelt are separated in this report from the varieties of wheat on account of their peculiar characteristics. The emmers and spelts are distinguished by the fact that in ordinary threshing the kernels are not separated from the chaff: the chaff generally constituting about 21 to 26 per cent of the total weight of the product in the case of the emmers, and about 27 to 35 per cent in the case of the spelts. The latter are, as a rule, much the coarser. In estimating the yield of these grains, it is obvious that no comparison can be made with wheat until a proper deduction has been made for the chaff present. The neglect of this precaution is one of the reasons why Common Emmer (often incorrectly called Speltz) has attracted an undue amount of attention of late. This grain, after threshing and grinding, makes valuable food for animals, but it seldom gives a yield equal to that of the best varieties of other cereals. Some farmers who have cut their emmer green for fodder report that it is unsatisfactory in that condition, partly, no doubt, on account of the awns which are present.

The only new emmer introduced this year is Triticum monococcum, a variety with very small and pretty heads, presenting a most attractive appearance in the field. It gave the heaviest yield in the plots this season, but will probably not maintain that position in the future as its extreme lateness gave it a distinct advantage this year owing to the peculiar character of the weather.

The plots of emmer and spelt were one-fortieth of an acre, except in the case of Triticum monococcum, which was grown on one-eightieth of an acre only. The grain was sown on April 17, at the rate of about 120 pounds per acre.

As some confusion exists at present in regard to the number of pounds which should be considered as a bushel of emmer or spelt, the yield is given in the following table in pounds per acre :—

EMMER AND SPELT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.	Weight per Measured Bushel after Cleaning.	Rusted.
				In.		In.	Lbs.	Lbs.	
1	Triticum monococcum....	Sept. 11..	147	40-42	Stiff	$2\frac{1}{4}$-3	2720	25	Slightly.
2	Red Spelt (No. 1990)	Aug. 19..	124	45-47	"	$3\frac{1}{4}$-4	2660	$27\frac{1}{2}$	"
3	Smooth Spelt (No. 1993)..	" 18..	123	43-45	"	$4\frac{1}{4}$-5	2380	29	"
4	White Spelt (No. 1991)...	" 17..	122	48-50	"	$4\frac{1}{4}$-5	1940	29	"
5	Long Emmer (No. 1994)..	" 29..	134	42-44	"	3 -$3\frac{3}{4}$	1760	$28\frac{1}{2}$	"
6	Red Emmer (No. 1989) ...	" 19..	124	40-42	"	$2\frac{1}{4}$-3	1740	32	"
7	White Bearded Spelt (No. 1995)	" 16..	121	34-36	"	3 -$3\frac{3}{4}$	1600	29	"
8	Black Bearded Spelt (No. 1985)	" 16..	121	38-40	Medium..	$3\frac{3}{4}$-$4\frac{1}{4}$	1580	27	"
9	White Emmer (No. 1981)..	" 28..	133	41-43	Stiff	$2\frac{1}{4}$-3	1540	30	"
10	Ufa Emmer (Washington, No. 2959)..............	" 9..	114	34-36	Medium..	$1\frac{3}{4}$-$2\frac{1}{4}$	1320	$33\frac{1}{2}$	"
11	Common Emmer ("Speltz")	" 12..	117	31-33	Stiff	$1\frac{3}{4}$-$2\frac{1}{4}$	1300	35	"
12	Thick Emmer (No. 1984)..	" 17..	122	34-36	"	2 -$2\frac{3}{4}$	1020	29	"

OATS.

Five new names were added to the list of varieties of oats in the uniform test this season.

Excelsior is a new black oat produced by Garton Bros. (England). The original sample was remarkably plump and weighed 44 pounds to the measured bushel.

Storm King is another new oat produced by Garton Bros. The seed received was very large but not remarkably plump, weighing $40\frac{1}{2}$ pounds per measured bushel. This variety presents a very striking appearance in the field, producing straw of very large diameter. It, however, lodged slightly in some parts of the plot. The yield obtained was rather small, but the figures are not published, as the quantity of seed on hand was not sufficient to sow the plot as thickly as was desirable. Oats of such remarkable size require a larger quantity of seed per acre than those of smaller dimensions.

Golden Fleece and Sheffield Standard were advertised as two distinct varieties, but the difference, if any, between them is very slight. The original samples of seed received weighed only $33\frac{3}{4}$ pounds per bushel in each case.

The Chinese Naked oat has the peculiarity of threshing out free from husk. The yield given in the table represents, therefore, free kernels. In order to make this comparable with the yields of the other varieties of oats, the quantity obtained must be considered as about 72 per cent of that which would have been obtained had the hulls remained on the oats, most varieties of oats having only about 72 per cent of kernel as ordinarily threshed. Estimated in this way the yield of Chinese Naked oat becomes 44 bushels 4 pounds per acre.

All the plots of oats were sown April 20, except Chinese Naked, which was sown April 17. The plots were one-fortieth of an acre, and the seed was sown at the rate of two bushels per acre.

The yield per acre is expressed in 'bushels' of 34 pounds.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, includi'g Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Measured Bushel after Cleani'g	Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs.	
1	Golden Giant	Aug. 14.	116	46—48	Stiff ...	7½— 9	86	16	34½	Considerably.
2	Probstey	" 16.	118	46—48	Weak ..	8 — 9½	80	..	36	Badly.
3	Holland*	" 17.	119	45—47	" ..	8½—10	77	22	35	"
4	Dixon*	" 15.	117	48—50	Stiff ...	8 — 9½	77	22	35½	"
5	Scotch Potato	" 14.	116	49—51	Medium	9 —10½	77	2	37	Slightly.
6	Bestehorn's Abundance	" 16.	118	44—46	Weak ..	7½— 9¼	75	30	35	Badly.
7	Virginia White Abundance	" 17.	119	40—42	" ..	6½— 8	75	10	37½	"
8	Great Northern	" 14.	116	44—46	Medium	7 — 8½	74	24	35½	Considerably.
9	White Giant	" 14.	116	44—46	Stiff ...	8 — 9½	74	4	35½	Slightly.
10	Golden Beauty	" 12.	114	45—47	" ...	8 — 9½	73	18	35	Considerably.
11	Golden Tartarian	" 18.	120	46—48	Medium	8 — 9½	71	26	34½	Badly.
12	Banner	" 13.	115	40—42	Stiff ...	7 — 8½	71	6	36½	Considerably.
13	Abundance	" 13.	115	44—46	Medium	8½— 9½	71	6	36½	Slightly.
14	Twentieth Century	" 17.	119	45—47	" ..	8½—10	71	6	38	Considerably.
15	Siberian	" 16.	118	44—46	Stiff ...	8½— 9¾	70	20	34½	Badly.
16	Columbus	" 13.	115	40—42	Weak ..	7 — 8½	70	20	34½	"
17	Swedish Select	" 17.	119	38—40	Medium	6 — 7½	70	20	36½	"
18	Mennonite	" 15.	117	42—44	" ..	8½— 9½	70	..	34	"
19	Hazlett's Seizure	" 14.	116	43—45	Stiff ...	7½— 9	68	28	35	Slightly.
20	Improved Ligowo	" 13.	115	44—46	Medium	8 — 8½	67	22	37	Considerably.
21	Sensation	" 15.	117	44—46	" ..	7½— 9	67	22	37½	"
22	Excelsior (black)	" 17.	119	42—44	Stiff ...	7½— 8½	67	22	36½	"
23	Black Beauty	" 13.	115	40—42	Weak ..	8½—10½	67	2	35	"
24	Kendal White*	" 14.	116	45—47	Medium	8½—10	67	2	34½	"
25	Wide Awake	" 16.	118	42—44	Stiff ...	6¾— 8	66	16	36	Slightly.
26	Uberfluss	" 16.	118	44—46	Medium	6½— 7¾	66	16	34	Badly.
27	American Triumph	" 18.	120	40—42	Stiff ...	7½— 8¾	65	30	35	Considerably
28	Sorgenfrei	" 16.	118	43—45	Weak ..	7¼— 8¾	65	10	36	"
29	Australian	" 17.	119	46—48	Medium	8 — 9½	65	10	35	Badly.
30	Golden Fleece	" 15.	117	46—48	Stiff ...	7 — 8½	64	24	34	Considerably
31	Pense White*	" 12.	114	47—49	Medium	9 —10½	64	4	37	Badly.
32	Atlantic	" 17.	119	44—46	Weak ..	7½— 8¾	62	32	35½	"
33	Salines	" 17.	119	47—49	Stiff ...	7¼— 9	62	32	35	Considerably.
34	Lincoln	" 13.	115	47—49	" ...	8½— 9	62	12	37½	Slightly.
35	Tartar King	" 10.	112	46—48	" ...	8½— 9½	61	26	36½	Badly.
36	Improved American	" 13.	115	39—41	" ...	7 — 8½	61	26	36	Slightly.
37	Waverley	" 14.	116	48—50	" ...	7½— 9	61	6	35½	"
38	Olive Black*	" 15.	117	44—46	Weak ..	8½—10	61	6	35½	Badly.
39	Forbes*	" 18.	120	44—46	Medium	8¾— 9½	61	6	34	Considerably.
40	Irish Victor	" 15.	117	39—41	Stiff ...	7½— 9½	60	20	36	Slightly.
41	Danish Island	" 13.	115	43—45	" ...	7 — 8½	60	20	35½	"
42	Olive White*	" 14.	116	47—49	Weak ..	8½— 9½	60	20	35	Badly.
43	Goldfinder	" 16.	118	45—47	Medium	7¼— 8½	59	14	34½	Considerably.
44	Milford White*	" 14.	116	45—47	Weak ..	9 —10½	59	14	35	"
45	Big Four (Salzer's)	" 16.	118	41—43	Stiff ...	7½— 8½	57	22	36	"
46	Kendal Black*	" 15.	117	48—50	Weak ..	8½—10	57	22	35	Badly.
47	Prolific Black Tartarian	" 15.	117	48—50	" ..	9½—11	57	2	35	"
48	Flying Scotchman	" 15.	117	42—44	" ..	6 — 7½	56	16	35½	"
49	Bavarian	" 13.	115	41—43	" ..	7 — 8½	56	16	35	Slightly.
50	American Beauty	" 15.	117	46—48	" ..	7½— 9	55	30	36	Badly.
51	Joanette (black)	" 16.	118	37—39	Medium	7 — 8¼	55	10	36½	Considerably.
52	Holstein Prolific	" 14.	116	38—40	Stiff ...	7½— 9½	55	10	35½	"
53	Thousand Dollar	" 15.	117	44—46	Medium	7½— 9	55	10	36	Badly.
54	Buckbee's Illinois	" 17.	119	40—42	" ..	7¼— 8¼	54	24	36½	Considerably.
55	Sheffield Standard	" 17.	119	40—42	" ..	7½— 8½	52	32	37	Badly.
56	White Russian	" 14.	116	39—41	Weak ..	6½— 7½	51	26	36	"
57	Milford Black*	" 15.	117	45—47	" ..	7½— 9½	51	6	35½	"
58	New Zealand	" 18.	120	46—48	Medium	7¼— 9	50	..	36½	"
59	Anderbecker	" 16.	118	38—40	" ..	7 — 8¼	50	..	35	Considerably.
60	White Schonen	" 12.	114	44—46	" ..	8 — 9½	48	8	35	Slightly.
61	Pioneer (black)	" 16.	118	37—39	Weak ..	7½— 8½	48	8	36	Badly.
62	Early Golden Prolific	" 14.	116	42—44	Medium	8 — 9½	47	22	37	Considerably.
63	Wallis	" 13.	115	43—45	" ..	7½— 9	44	4	35½	"
64	Pense Black*	" 15.	117	43—45	" ..	7½— 9	41	6	36	Badly.
65	Chinese Naked	" 20.	125	50—52	Stiff ...	9½—11	31	26	46½	"

* Cross-bred varieties produced at the Experimental Farms.

Most Productive Varieties of Oats.—Taking the average of the returns for series of years, the varieties of oats found to be the most productive at this Farm ar White Giant, Holstein Prolific, Banner, Columbus, Mennonite, Golden Giant, Ameri can Triumph, Joannette, Black Beauty and Golden Beauty.

Earliest Varieties of Oats.—Wallis is the earliest variety which has been grow at this Farm for the past five years. It ripens, as a rule, about two or three days earlie than White Giant or Banner, but is very much less productive.

Welcome and White Wonder, which were discontinued from the plots at thi Farm some years ago on account of their small yield, ripen as a rule about five or si days earlier than Wallis.

SIX-ROW BARLEY.

The plots were all one-fortieth of an acre in extent. The seed was sown at th rate of 1¾ bushels per acre, the date of sowing being April 18.

The yield per acre is expressed in 'bushels' of 48 lbs.

SIX-ROW BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		Number of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Rusted.
					Inches.		Inches.	Bush.	Lbs.	Lbs.	
1	Blue Long Head	July	25	98	34—36	Weak...	2½—3¼	58	36	47	Considerably
2	Summit*	"	25	98	46—48	Medium	3¼—3¾	54	28	49½	Slightly.
3	Brome*	"	27	100	40—42	Weak...	3 —3½	53	36	49½	"
4	Silver King	Aug.	2	106	32—34	Medium	3¼—4	53	16	49½	"
5	Trooper*	July	26	99	39—41	Stiff....	2¾—3¼	52	4	49½	"
6	Garfield*	"	25	98	44—46	Medium	2¾—3¼	52	4	50½	"
7	Stella*	"	25	98	44—46	"	3 —3½	51	12	48½	"
8	Albert*	Aug.	2	106	34—36	"	3¼—3¾	47	4	48	"
9	Empire*	July	27	100	37—39	"	2¼—2¾	45	20	50	"
10	Baxter	"	24	97	41—43	"	2 —2½	45	20	49½	"
11	Yale*	"	27	100	37—39	"	2½—3	45	..	50	"
12	Odessa	"	27	100	35—37	"	2¾—3½	44	28	48	"
13	Common	"	25	98	36—38	Weak...	2¾—3¼	44	28	47½	"
14	Norwegian (No. 8)	"	26	99	38—40	"	2¼—2¾	44	28	49	"
15	Oderbruch	"	27	100	35—37	Medium	2½—3¼	42	44	49	"
16	Rennie's Improved	"	25	98	35—37	Weak...	2¼—2¾	42	44	49	"
17	Nugent*	Aug.	3	107	31—33	Stiff....	3 —3¾	42	4	48½	"
18	Royal*	"	2	106	35—37	"	2¾—3¼	41	12	48½	"
19	Champion (beardless)	July	23	96	40—42	Weak...	3 —3¾	40	20	48	"
20	Mensury	Aug.	1	105	35—37	Stiff....	3¾—4¼	38	36	49	"
21	Sisolsk	July	24	97	34—36	Weak...	2½—3¼	38	36	46	Considerably
22	Claude*	Aug.	3	107	27—29	Medium	2½—3	35	40	49	"
23	Argyle*	July	27	100	28—30	Stiff....	2¾—3¼	34	28	49	Slightly.
24	Mansfield*	"	27	100	27—29	Medium	2 —2¾	34	28	49	Considerably
25	Chinese Hulless	"	31	104	25—27	"	2 —2¾	25	40	59½	"
26	Hulless Black	"	23	96	26—28	Weak...	1½—2	25	20	60	"

*Cross-bred varieties produced at the Experimental Farms.

Most Productive Varieties of Six-row Barley.—Taking the average of the returns for a series of years, the varieties of six-row barley found to be the most productive at this Farm are Odessa, Blue Long Head, Mensury, Stella and Trooper.

Earliest Varieties of Six-row Barley.—There are no important differences in earliness to be noted among those varieties of six-row barley which have been tested for five years or longer at this Farm. Odessa, Stella and Trooper are about one day earlier than Blue Long Head and Mensury.

TWO-ROW BARLEY.

Attention is called to two new varieties of two-row barley, imported this year, Maltster and Brewer's Favourite. The original seed of both of these was very plump, and weighed 54¾ lbs. to the measured bushel. It will be seen that Maltster has given a good yield of heavy grain, but Brewer's Favourite has not done remarkably well. These varieties were originated by Garton Bros., England.

The plots of two-row barley were sown on April 17, the seed being used at the rate of two bushels to the acre. The yield given is calculated from one-fortieth of an acre except in the case of Princess Sialof, where only one-eightieth of an acre is used, as one-half of the plot ripened somewhat earlier than the other.

The yield per acre is expressed in 'bushels' of 48 lbs.

TWO-ROW BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs.	
1	Maltster	Aug. 11	116	37—39	Medium	3 —3¾	48	36	52¼	Slightly.
2	Princess Sialof	" 4	109	31—33	"	3¾—4¼	48	16	49	Badly.
3	Canadian Thorpe	" 2	107	38—40	Stiff	3 —3½	46	32	50½	Slightly.
4	Invincible	July 31	105	36—38	"	2¾—3¼	46	32	52	"
5	Jarvis*	Aug. 1	106	45—47	"	4¼—4¾	46	12	52¼	"
6	French Chevalier	July 31	105	33—35	Medium	3½—4¼	44	28	50¼	"
7	Besthorn's Kaiser	Aug. 3	108	36—38	Stiff	2¾—3¼	43	36	51½	"
8	Plumage	" 1	106	36—38	"	2½—3	43	16	53	"
9	Beaver*	July 30	104	45—47	"	3¼—3¾	42	24	51	Considerably.
10	Gordon*	Aug. 1	106	38—40	"	2¾—3¼	41	32	51	Slightly.
11	Harvey*	Aug. 4	109	38—40	Medium	3¾—4¼	40	..	52	Considerably.
12	Fichtel Mountain	July 30	104	28—30	"	2¾—3¼	39	28	48	"
13	Sidney*	Aug. 2	107	38—40	Stiff	3½—4	39	8	52	Slightly.
14	Dunham*	" 3	108	40—42	"	3¼—3¾	37	44	51½	"
15	Danish Chevalier	" 2	107	41—43	"	4¼—4¾	37	4	50	Considerably.
16	Fulton*	" 3	108	36—38	Medium	3 —3½	37	4	50	"
17	Logan*	Aug. 4	109	40—42	"	3¼—3¾	37	4	52¼	Slightly.
18	Clifford*	" 4	109	37—39	"	3¼—3¾	36	32	51	Considerably.
19	Brewer's Favourite	" 11	116	32—34	"	3¼—4	35	40	52	Slightly.
20	Standwell	" 4	109	40—42	"	2¾—3¼	35	..	51	"
21	Pelham*	July 28	102	33—35	"	3 —3½	34	28	52	"
22	Newton	Aug. 3	108	35—37	Stiff	2¾—3¼	31	12	51½	"

* Cross-bred varieties produced at the Experimental Farms.

Most Productive Varieties of Two-row Barley.—Taking the average of the returns for a series of years, the varieties of two-row barley found to be the most productive at this Farm are: Canadian Thorpe, French Chevalier, Beaver and Danish Chevalier.

Earliest Varieties of Two-row Barley.—The earliest varieties of two-row barley grown at this Farm are Jarvis, Beaver, Gordon. These are all cross-bred sorts produced here. They ripen, as a rule, two or three days earlier than Canadian Thorpe and French Chevalier.

PEASE.

The plots of pease were one-fortieth of an acre each. The seed was sown on April 22, at the rate of from two to three bushels per acre, according to the size of the pea. The yield per acre is expressed in 'bushels' of 60 pounds.

PEASE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	Number of Days maturing.	Character of growth.	Length of Straw.	Length of Pod.	Yield per Acre.		Weight per Measured bushel after Cleaning.
					Inches.	Inches.	Bush.	Lbs.	Lbs.
1	English Gray	Aug. 21	121	Strong	67—70	2¼—3	34	20	55¾
2	Crown	" 19	119	"	47—50	2¼—2¾	34	..	60½
3	Prussian Blue	" 18	118	"	62—65	2 —2½	33	40	62
4	Golden Vine	" 21	121	"	57—60	2 —2½	32	40	61
5	Daniel O'Rourke	" 18	118	"	62—65	1¾—2¼	32	..	61½
6	Paragon*	" 17	117	Medium	33—36	2¼—2¾	31	20	61½
7	Victoria*	" 25	125	Strong	70—73	2 —2¾	31	20	60½
8	Picton*	" 22	122	"	65—68	2 —2½	31	..	61¼
9	Gregory*	" 20	120	"	63—66	2¼—2¾	30	40	61
10	Duke*	" 20	120	"	70—73	2¼—2¾	30	40	61½
11	Bruce*	" 22	122	"	72—75	2¼—2¾	30	40	61½
12	Chancellor	" 18	118	Medium	60—63	1½—2¼	30	20	60½
13	Mummy	" 22	122	"	59—62	2 —2½	30	..	60¾
14	Perth*	" 18	118	Strong	61—64	2¼—3	29	..	61½
15	Kent*	" 23	123	"	67—70	2½—3¼	29	..	60½
16	Pride	" 22	122	"	50—53	2¼—2¾	28	40	61
17	Cooper*	" 17	117	Medium	62—65	2¼—2¾	28	..	61
18	Trilby*	" 18	118	Strong	63—66	2¼—2¾	27	40	62
19	Archer*	" 23	123	"	70—73	1¾—2¼	27	20	62
20	German White	" 20	120	"	67—70	2 —2½	27	20	61
21	King*	" 21	121	"	64—67	2¼—2¾	27	20	61
22	White Marrowfat (Large)	" 19	119	"	67—70	2½—3	27	20	60½
23	Prince Albert	" 19	119	"	63—66	2½—3	26	20	61¼
24	Prince*	" 23	123	"	72—75	2¼—2¾	26	20	60¾
25	Alma*	" 17	117	"	60—63	2¼—2¾	26	..	59
26	Canadian Beauty	" 18	118	"	65—68	2½—3	26	..	62
27	Wisconsin Blue	" 19	119	"	57—60	2 —2½	25	40	62
28	Pearl*	" 19	119	"	57—60	2¼—2¾	25	20	61¼
29	Early Britain	" 22	122	"	69—72	2¼—2¾	24	40	58½
30	New Potter	" 19	119	"	67—70	2 —2½	23	40	61½
31	Elliot*	" 20	120	"	68—71	2 —2½	23	20	61½
32	Lanark*	" 19	119	"	60—63	1¾—2¼	23	20	60½
33	Agnes*	" 19	119	"	62—65	1¾—2¼	23	..	61½
34	Carleton*	" 23	123	"	60—63	2¼—2¾	23	..	61¼
35	Macoun*	" 20	120	"	61—64	2¼—2¾	23	..	61½
36	Black-eyed Marrowfat	" 18	118	"	60—63	2¼—3	22	40	61
37	White Wonder	" 16	116	Medium	38—40	2¼—2¾	22	40	61
38	Arthur*	" 18	118	Strong	59—62	2¼—3	22	40	61½
39	Field Gray	" 17	117	Medium	57—60	1¾—2¼	22	..	57¾
40	Fergus*	" 20	120	Strong	60—63	2¼—2¾	21	..	61¼
41	Centennial	" 22	122	"	67—70	2 —2¾	20	40	60
42	Mackay*	" 20	120	"	65—68	2¼—3	20	..	61½
43	Nelson*	" 19	119	Medium	47—50	2 —2½	15	40	61

* Cross-bred varieties produced at the Experimental Farms.

Most Productive Varieties of Pease.—Taking the average of the returns for a series of years, the varieties of pease found to be most productive at this Farm are Arthur and Paragon.

Earliest Varieties of Peas.—Chancellor and White Wonder ripen, as a rule, about two days earlier than Paragon and Arthur. Chancellor gives a good crop, but White Wonder gives a light yield.

SPRING RYE.

One plot of spring rye (one-fortieth acre) was sown on April 17, the seed being used at the rate of one and one-half bushels to the acre. The rye made a strong and fairly even growth, and ripened on August 10. The straw was stiff, its length (including the head) being 53 to 55 inches. The length of the heads was from three to three and three-quarter inches. The number of days from sowing to harvesting was 115. The yield, expressed in 'bushels' of 56 pounds, was 21 bushels 24 pounds per acre; and the weight per measured bushel (after cleaning) was 55 pounds.

SOJA BEANS.

Two plots of one-fortieth acre each were sown in rows at different distances apart, viz.: 21 and 28 inches, to gain information as to the best distance for sowing. The soil was a light sandy loam, which received a dressing of barn-yard manure during the winter of 1899 and 1900 of about 12 tons per acre. The previous crop was horse beans. After the beans were cut the land was ploughed late in the autumn to the depth of about seven or eight inches, and left in that condition until the following spring, when it was cultivated once with a two-horse cultivator and twice with a smoothing harrow. The beans were sown with a seed-drill on May 9, and cut on September 22. Half of each plot was cut green, when the pods were well formed, but the beans were still soft. The other half of each plot was allowed to ripen.

Plot 1.—Sown in rows 21 inches apart; growth strong and even, leafy; average height, 32 to 37 inches; total yield of green crop, 12 tons 960 lbs. per acre; yield of beans, 14 bushels 40 lbs. per acre.

Plot 2.—Sown in rows 28 inches apart; growth very strong and leafy; average height 34 to 38 inches. Plot all standing; stalks considerably stiffer than in plot No. 1. Total yield of green crop, 15 tons 1,200 lbs per acre; yield of beans, 13 bushels 20 lbs. per acre.

HORSE BEANS.

Two plots of one-fortieth acre each were sown in rows at different distances apart, viz.: 21 and 28 inches, to gain information as to the best distance for sowing. The land was adjoining that used for soja beans, was similar in quality and received the same treatment. The previous crop was flax. The beans were sown with the seed drill on May 9, and cut on September 22.

Half of each plot was cut green before the beans were ripe. The other half of each plot was allowed to ripen.

Plot 1.—Sown in rows 21 inches apart; growth strong, pods fairly numerous; height 50 to 52 inches; crop all standing. Total yield, 13 tons 560 lbs. per acre. Yield of beans, 20 bushels 40 lbs. per acre.

Plot 2.—Sown in rows 28 inches apart; growth very strong; pods numerous; height 51 to 55 inches; crop all standing; stalks considerably stiffer than in plot No. 1. Total yield 13 tons 880 lbs. per acre. Yield of beans, 32 bushels per acre.

MILLET.

The plots of millet were one-eightieth of an acre each. The seed was sown with a hand seed drill on May 19. The plots were cut when the seed was in the doughy state.

MILLET—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Cutting.	Length of Straw.	Character of Growth.	Weight per Acre, Green.		Weight per Acre, Dry.	
			Inches.		Tons.	Lbs.	Tons.	Lbs.
1	Pearl or Cat-tail	Sept. 8	38—42	Weak	8	160	3	1,840
2	Algerian	" 8	65—70	"	6	800	4	1,200
3	Moha Hungarian	" 3	28—32	Medium	5	800	2	1,760
4	White Round French	" 3	38—40	"	5	...	2	1,360
5	Red Orenburg	" 8	35—38	"	3	1,760	2	80
6	Italian or Indian	" 6	54—58	"	3	1,680	1	960

TURNIPS.

Two sowings were made of each variety, the first on May 7 and the second on May 21. The seed was used at the rate of about four pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller, which flattened the drills nearly one-half, leaving a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about seven inches apart in the rows.

The roots were pulled on two different dates: October 19 and November 2. The yield per acre has been calculated from the weight of roots gathered from two rows, each 33 feet long.

The results obtained this season in the case of turnips and of other root crops do not altogether harmonise with those of previous years. This is no doubt due chiefly to two causes: first, the drought in spring, which delayed the germination of most of the seed of the first sowing, and second, the unusually severe frosts which occurred between October 19 and November 2.

In Canada the ton contains 2,000 lbs.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing, 1st Pulling.		Yield per Acre from 2nd Sowing, 1st Pulling.		Yield per Acre from 1st Sowing, 2nd Pulling.		Yield per Acre from 2nd Sowing. 2nd Pulling.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	New Century	47	1,865	23	1,850	50	1,970	24	345
2	Jumbo	46	235	24	1,665	46	400	25	325
3	Kangaroo	44	1,430	24	1,005	45	90	24	1,500
4	Mammoth Clyde	41	665	30	1,545	41	1,160	30	390
5	Good Luck	40	1,510	28	1,090	41	665	30	60
6	Emperor Swede	37	1,570	20	425	39	210	20	1,085
7	Elephant's Master	33	1,155	20	260	25	1,315	21	900
8	Drummond Purple Top	33	990	30	225	31	40	30	225
9	Shamrock Purple Top	33	825	26	965	34	805	26	1,955
10	Magnum Bonum	30	555	24	345	25	820	22	550
11	Imperial Swede	30	390	29	740	30	225	28	595
12	Bangholm Selected	29	905	24	15	20	755	23	1,850
13	Selected Purple Top	29	575	28	1,915	32	1,340	24	345
14	Hartley's Bronze	29	245	27	780	24	1,665	25	1,315
15	Carter's Elephant	27	120	17	320	25	490	20	1,745
16	Sutton's Champion	26	1,625	24	1,830	27	285	28	1,750
17	Perfection Swede	25	1,975	24	1,005	29	1,565	24	1,170
18	Skirvings	25	1,480	19	445	23	1,190	20	1,415
19	East Lothian	23	1,520	23	860	26	1,790	24	840
20	Halewood's Bronze Top	23	1,520	21	1,890	28	1.420	26	1,790
21	Hall's Westbury	23	695	19	1,270	26	1,460	15	1,515

	Tons.	Lbs.
The average yield from the 1st sowing, 1st pulling, was	32	1,126
The average yield from the 1st sowing, 2nd pulling, was	32	460
The average yield from the 2nd sowing, 1st pulling, was	24	974
The average yield from the 2nd sowing, 2nd pulling, was	24	1,508

MANGELS.

Two sowings were made of each variety, the first on May 7, and the second on May 21. The seed was used at the rate of about six pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about seven inches apart in the rows. The roots were pulled on two different dates: October 19 and November 2. The yield has been calculated in each case from the weight of roots gathered from two rows, each 33 feet long.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing, 1st Pulling.		Yield per Acre from 2nd Sowing, 1st Pulling.		Yield per Acre from 1st Sowing, 2nd Pulling.		Yield per Acre from 2nd Sowing, 2nd Pulling.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Mammoth Long Red	41	335	21	900	37	745	20	1,250
2	Triumph Yellow Globe	40	190	18	1,125	32	1,505	14	1,040
3	Selected Yellow Globe	39	375	17	815	39	1,200	17	1,640
4	Half Long Sugar White	35	620	15	1,350	34	1,300	15	1,185
5	Gate Post	34	1,795	20	1,580	36	1,590	26	140
6	Mammoth Yellow Intermediate	34	1,630	15	1,845	37	1,240	20	590
7	Giant Sugar Mangel	34	1,135	15	1,680	30	885	17	650
8	Giant Yellow Intermediate	34	475	17	815	43	130	16	340
9	Prize Winner Yellow Globe	32	845	18	630	26	1,625	16	1,330
10	Prize Mammoth Long Red	32	350	20	1,250	46	1,720	21	75
11	Lion Yellow Intermediate	30	225	19	1,435	46	70	19	1,270
12	Yellow Intermediate	29	1,730	14	495	39	1,035	25	820
13	Half Long Sugar Rosy	29	740	14	215	22	220	13	1,720
14	Giant Yellow Globe	25	1,645	16	1,990	34	310	20	1,415
15	Selected Mammoth Long Red	24	1,500	22	385	31	1,030	26	965
16	Leviathan Long Red	23	200	13	1,885	24	180	15	690

	Tons.	Lbs.
The average yield from the 1st sowing, 1st pulling, was	32	1,237
The average yield from the 1st sowing, 2nd pulling, was	35	424
The average yield from the 2nd sowing, 1st pulling, was	17	1,400
The average yield from the 2nd sowing, 2nd pulling, was	19	445

CARROTS.

Two sowings were made of each variety, the first on May 7 and the second on May 21. The seed was used at the rate of about four pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about five inches apart in the rows. The roots were pulled on two different dates: October 19 and November 2. The yield has been calculated in each case from the weight of roots gathered from two rows, each 33 feet long.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing, 1st Pulling.		Yield per Acre from 2nd Sowing, 1st Pulling.		Yield per Acre from 1st Sowing, 2nd Pulling.		Yield per Acre from 2nd Sowing, 2nd Pulling.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	New White Intermediate	33	1,815	25	160	34	1,300	25	325
2	Mammoth White Intermediate	30	1,875	22	1,210	26	1,625	21	900
3	Ontario Champion	29	1,070	22	550	26	140	22	880
4	Giant White Vosges	29	80	21	570	31	370	21	570
5	Improved Short White	28	430	20	755	33	165	21	1,560
6	White Belgian	27	1,110	19	1,930	28	430	18	630
7	Long Yellow Stump Rooted	26	1,810	18	300	22	880	14	50
8	Half Long White	21	1,890	20	1,745	22	1,870	20	95
9	Carter's Orange Giant	21	1,065	18	135	24	1,995	17	1,640
10	Half Long Chantenay	21	75	16	175	23	1,685	19	1,765
11	Early Gem	16	1,495	15	1,020	20	1,580	17	1,310

	Tons.	Lbs.
The average yield from the 1st sowing, 1st pulling, was	26	247
The average yield from the 1st sowing, 2nd pulling, was	26	1,640
The average yield from the 2nd sowing, 1st pulling, was	20	50
The average yield from the 2nd sowing, 2nd pulling, was	19	1,975

SUGAR BEETS.

Two sowings were made of each variety, the first on May 7 and the second on May 21. The seed was used at the rate of about six pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about five inches apart in the rows. The roots were pulled on two different dates: October 19 and November 2. The yield has been calculated in each case from the weight of roots gathered from two rows, each 33 feet long. Though all the varieties mentioned here are commonly classed as sugar beets, it should be noted that the only ones recommended for use in the manufacture of sugar are Wanzleben, French Very Rich, and Vilmorin's Improved.

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing 1st Pulling.		Yield per Acre from 2nd Sowing 1st Pulling.		Yield per Acre from 1st Sowing 2nd Pulling.		Yield per Acre from 2nd Sowing 2nd Pulling.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Improved Imperial	39	540	21	900	39	1,035	21	1,230
2	Red Top Sugar	36	105	20	920	31	370	14	380
3	Danish Red Top	35	455	16	1,495	32	1,670	15	525
4	Danish Improved	32	1,010	15	690	30	390	16	505
5	Wanzleben	29	1,565	13	70	30	1,545	13	1,060
6	French Very Rich	23	695	18	1,455	23	1,190	19	1,930
7	Royal Giant	20	1,250	15	1,185	27	450	18	630
8	Vilmorin's Improved	19	610	7	1,180	13	1,885	8	1,820

	Tons.	Lbs.
The average yield from the 1st sowing, 1st pulling, was	29	1,029
The average yield from the 1st sowing, 2nd pulling, was	28	1,317
The average yield from the 2nd sowing, 1st pulling, was	16	237
The average yield from the 2nd sowing, 2nd pulling, was	16	10

INDIAN CORN.

The corn was sown with the seed drill in rows thirty-five inches apart, and was also sown in hills thirty-five inches apart each way. When the plants were about six inches high they were thinned out, leaving them from six to eight inches apart in the rows, and leaving four or five plants in each hill. The seed was sown May 27, and the corn was cut green for ensilage September 30. The yield has been calculated from the weight of crop cut from two rows, each 33 feet long.

For the making of ensilage the corn should be cut when the kernels are in the late milk or doughy stage; but the summer at Ottawa is not always warm enough to bring the later varieties to this state of maturity before it is necessary to cut the crop to avoid frost.

In Canada the ton contains 2,000 pounds.

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Growth.	Height.	Leafiness.	Condition when Cut.	Yield per Acre Grown in Rows.		Yield per Acre Grown in Hills.	
			In.			Tons.	Lbs.	Tons.	Lbs.
1	Early Mastodon	Strong	100-110	Leafy	Late milk	27	835	26	800
2	King of the Earliest	"	80- 90	Very leafy	Early milk	21	955	17	155
3	Giant Prolific Ensilage	"	80- 90	Leafy	"	20	755	18	300
4	Mammoth Cuban	"	85- 95	Very leafy	"	19	1,600	19	775
5	Pride of the North	Very strong.	95-105	Leafy	"	19	500	18	1,290
6	Early Butler	Strong	90-100	Very leafy	"	19	280	19	500
7	Compton's Early	Medium	80- 90	Leafy	Late milk	18	1,840	17	1,860
8	Champion White Pearl	Strong	80- 90	Very leafy	Early milk	18	355	17	1,200
9	Selected Leaming	"	80- 90	"	"	17	1,970	16	10
10	Thoro'bred White Flint	Very strong.	95-105	"	"	17	1,200	17	540
11	Red Cob Ensilage	"	95-105	"	"	17	100	14	160
12	Superior Fodder	"	90-100	"	"	16	780	16	340
13	Cloud's Early Yellow	"	85- 95	"	"	16	560	15	1,955
14	Sanford	Medium	85- 95	Medium	Late milk	15	1,570	13	1,500
15	White Cap Yellow Dent	"	80- 90	Leafy	Early milk	15	1,460	12	1,300
16	Salzer's All Gold	"	75- 85	Very leafy	"	15	1,460	14	1,810
17	Longfellow	"	65- 75	Medium	Late milk	15	1,240	14	1,260
18	Mammoth Eight-rowed Flint	"	70- 75	"	"	15	140	13	1,720
19	North Dakota White	Strong	85- 95	Very leafy	"	14	1,700	15	1,515
20	Eureka	Medium	75- 85	"	Early milk	14	1,370	14	930
21	Evergreen Sugar	"	75- 85	Medium	"	14	600	13	1,555
22	Angel of Midnight	"	75- 85	"	Late milk	13	180	12	860
23	King Philip	"	65- 75	"	Early milk	11	1,100	11	1,760

The average yield from the rows was 17 tons 502 pounds per acre, and from the hills, 16 tons 352 pounds per acre; showing an advantage, this season, of 1 ton 150 pounds per acre in favour of the corn grown in rows.

INDIAN CORN SOWN AT DIFFERENT DISTANCES.

Three varieties were chosen for this test: Champion White Pearl, Selected Leaming and Longfellow. The seed was sown May 27 and the corn was cut for ensilage September 30. Sixteen rows of each variety were sown, that is, four rows at each of the distances mentioned, and the yield per acre has been calculated from the weight of crop obtained from the two inner rows in each case. The length of the portions of the rows cut for weighing was 33 feet.

Name of Variety.	Distance between the Rows.	Character of Growth.	Height when Cut.	Condition when Cut.	Yield per Acre.	
—	In.		In.		Tons.	Lbs.
Champion White Pearl	21	Medium	70—80	Early milk	28	1,078
" "	28	Strong	75—85	"	22	626
" "	35	"	85—95	"	19	665
" "	42	"	85—95	"	14	1,140
Selected Leaming	21	"	70—80	"	31	181
"	28	"	80—90	"	21	1,287
"	35	Very strong.	85 –95	"	17	375
"	42	" "	85—95	"	17	733
Longfellow	21	Weak	55—65	Late milk	15	1,752
"	28	"	55—65	"	14	1,469
"	35	Medium	60—70	"	14	820
"	42	"	70—80	"	14	59

It will be seen that, in every case, the largest yield per acre was obtained from the rows which were closest together. In previous years this has not always been so. The character of the season has evidently an important influence on the results.

GRAIN SOWN IN DIFFERENT QUANTITIES PER ACRE ON SANDY LOAM.

These experiments were all conducted on plots of one-fortieth of an acre each. The wheat was sown on April 25 and was ripe on August 11. The oats were sown April 25 and were ripe August 11. The barley was sown April 25 and was ripe August 8.

The results of the tests in previous years are published, for comparison, along with the figures obtained this year.

Name of Variety.	Quantity Sown per Acre.	Number of Days from Sowing to Harvesting.			Yield Per Acre.					
		1901.	1902.	1903.	1901.		1902.		1903.	
					Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Preston Wheat........	1 bushel....	100	108	108	10	20	24	..	15	..
" "	1¼ bushels...	100	108	108	15	..	20	40	14	20
" "	1½ " ..	100	108	108	19	40	15	20	20	40
" "	2 " ..	100	108	108	20	20	10	40	15	20
" "	2½ " ..	100	108	108	21	..	20	40	13	20
" "	3 " ..	100	108	108	19	40	17	20	16	40
Banner Oats............	1½ " ..	96	107	108	41	6	60	..	63	18
" "	2 " ..	96	107	108	59	14	45	30	56	16
" "	2½ " ..	96	107	108	57	2	52	32	79	14
" "	3 " ..	96	107	108	43	18	50	20	84	4
" "	3½ " ..	96	107	108	31	26	50	20	88	8
" "	4 " ..	96	107	108	35	10	54	4	67	22
Mensury Barley..........	1½ " ..	84	95	105	35	35	40	40	61	32
" "	2 " ..	84	95	105	37	19	28	16	60	..
" "	2½ " ..	84	95	105	43	11	27	24	54	28
" "	3 " ..	84	95	105	42	19	37	24	46	12
" "	3½ " ..	84	95	105	39	23	26	32	47	44
" "	4 " ..	84	95	105	43	11	45	..	35	40

GRAIN SOWN IN DIFFERENT QUANTITIES PER ACRE ON CLAY LOAM.

These experiments were all conducted on plots of one-fortieth of an acre each. The wheat was sown April 30 and was ripe August 16. The oats were sown April 30 and were ripe August 18. The barley was sown April 30 and was ripe August 11.

The results of the tests in previous years are published, for comparison, along with the figures obtained this year.

Name of Variety.	Quantity Sown per Acre.	Number of Days from Sowing to Harvesting.			Yield Per Acre.					
		1901.	1902.	1903.	1901.		1902.		1903.	
					Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Preston Wheat..........	1 bushel....	97	108	108	28	20	24	40	28	40
" "	1¼ bushels...	97	108	108	28	20	24	40	30	..
" "	1½ " ..	97	108	108	29	..	29	20	30	40
" "	2 " ..	97	108	108	26	20	28	..	28	..
" "	2½ " ..	97	108	108	26	20	30	..	29	40
" "	3 " ..	97	108	108	25	..	24	40	28	20
Banner Oats..........	1½ " ..	92	111	110	58	28	63	18	72	32
" "	2 " ..	92	111	110	65	30	62	12	78	28
" "	2½ " ..	92	111	110	67	2	72	32	74	4
" "	3 " ..	92	111	110	64	24	67	2	80	20
" "	3½ " ..	92	111	110	61	6	70	20	84	24
" "	4 " ..	92	111	110	57	22	67	2	88	28
Mensury Barley..........	1½ " ..	83	99	103	37	..	64	8	54	28
" "	2 " ..	83	99	103	40	35	70	40	59	28
" "	2½ " ..	83	99	103	44	3	68	16	48	16
" "	3 " ..	83	99	103	45	35	69	8	50	..
" "	3½ " ..	83	99	103	45	35	65	..	50	..
" "	4 " ..	83	99	103	44	3	62	24	58	16

DOUBLE ROWS OF GRAIN.

Important varieties of cereals which have been rejected from the uniform test plots as undesirable for general cultivation are retained for reference purposes, and are grown annually; two rows of each variety being sown, the distance between the rows being about six inches, and the length of the rows 33 feet. Each pair of rows is separated from the neighbouring pairs by a space of about two feet. In these double rows are also sown the new varieties of grain originated at this farm which are available only in very small quantities and which are being propagated for larger plots. A few of the best standard sorts are also grown in the double rows for comparison with the other varieties.

These double rows form an interesting object lesson for visitors, presenting as they do a large number of distinct types in a very small area.

The accompanying plate gives a good idea of the appearance of these double rows in the early stages of growth.

REPORT OF THE POULTRY MANAGER.

(A. G. GILBERT.)

OTTAWA, December 1, 1903.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I submit with pleasure the sixteenth annual report of the Poultry Department of the Central Experimental Farm.

Among other subjects, brought to the notice of the farmers as immediately affecting the poultry interests of the country, are the following:—

1. A rapidly growing demand for new laid eggs in winter and the superior quality of poultry flesh. Is the production in proportionate increase ?

2. Some obstacles to more rapid poultry development. How they may be overcome.

3. The detrimental practice (which is too common) of using birds of the smaller breeds for crossing, or for any other purpose, in preference to those of the utility pure breeds, such as Plymouth Rocks, Wyandottes, Orpingtons, &c., &c.

4. What experience has shown to be the best breeds for the farmer to adopt.

5. The value of building up strains of hardy fowls which will make good winter layers in cold houses, and the progeny of which will make early and rapid growing chickens. Instances of how this has been accomplished are given.

6. The experimental work of the year, in which is shown, in detail, the results of winter laying ; the hatching, rearing and proper feeding of chickens from incubator or nest to marketable age ; the summer and fall management of the young and old stock, and other information of practical import.

A feature of the past year was the high price of new laid eggs during the late summer and fall months. The probable cause of this—in the more general practice among farmers of causing their fowls to moult during the late summer months (the season of low value for eggs)—is pointed out in report, and the still further adoption of this business-like method is urged. It has been found from experience that in order to have fowls lay in winter it is necessary for them to moult during the summer, and as the moulting period is one of non-production it is wise to have that time of non-production when prices are lowest.

Some further experiments in the fattening of chickens in crate and pen, conducted by Mr. F. T. Shutt, chemist, will be found appended. It may be remembered that in experiments of a similar nature, carried on by the same gentleman last year, the advantage seemed to be with the birds kept in pens. This year the crate-kept birds make a slightly better showing. It will be interesting to note further results.

It is with gratification that I note the appointment of Mr. Victor Fortier, of St. Jerome, Que., as assistant in the management of the department under my charge. Mr. Fortier is an experienced poultry breeder and exhibitor, and his assistance will not only afford opportunity for extended usefulness of this department, but for the develop-

ment of the poultry interests of the province of Quebec, the requirements of which, in this respect, he is so well acquainted.

I have much pleasure in again mentioning the faithful services of Mr. George Deavy, who has for a number of years past assisted me in the care and management of the birds under my charge.

It is to be hoped that the subjects discussed and the information given in this report will be found of practical value by the farmers of the country and act as incentives to greater effort in the production of eggs in winter and the superior quality of poultry flesh in summer, and for which there is such demand.

I have the honour to be, sir,
Your obedient servant,

A. G. GILBERT.

Seventeen years ago the first annual report of this department was distributed among the farmers of the country. It contained information as to the breeds best calculated to make winter egg-layers and rapid flesh-forming chickens during summer, so permitting opportunity to make money at both seasons of the year. While the benefit likely to accrue from such a course of action was freely admitted, there was yet—on the part of many persons—a feeling of misgiving which found expression in the exclamation, Oh ! but when the production of winter eggs and the superior quality of poultry is more general, prices will become so low as to be profitless.' Happily such pessimistic foreboding has not been realized. On the contrary prices have either remained stationary or advanced and this notwithstanding an increased production. Comparison with the winter prices of ten years ago and those of last winter will give proof of this. In the case of the city of Toronto, for instance, the advance, during recent years, in winter prices—in face of greatly increased production in the surrounding country—is most marked. In that city eight or ten years ago twenty-five cents would have been considered full value for a dozen of new laid eggs. Last winter the same quality and quantity of eggs sold for forty cents. A corresponding advance in the value of the superior quality of poultry may also be noted. Not only in the district surrounding Toronto has there been increased winter egg and superior quality of poultry production, but throughout the greater part of the Dominion. Why then should prices not have become lower? The answer at once suggests itself, that there has been a greater proportionate increase in the number of consumers. While this is doubtless correct, it is not the only reason. It may be interesting to note some of the causes which experience has shown to mitigate against a greater and more rapid production.

WHY MORE RAPID POULTRY DEVELOPMENT DOES NOT TAKE PLACE.

Experimental work for many years has plainly shown that the obtaining of eggs in winter and a better class of poultry is not so easy as at first glance may seem. Success is dependent upon conditions which are not only more or less exacting according to location, but complete knowledge of which is imperative to success. This is not always realized. The numerous letters received by the writer from different points, show that many are anxious to get results before they know how to do so. And for that reason many try only to fail. On the part of the specialist expert knowledge is requisite. On the part of all, not only knowledge, but patience, perseverance, liking for the occupation and adaptability are necessary factors. Without them success is not likely to be attained.

(Photo. by F. T. Shutt.)

1. Small Colony-houses and Chickens. 2. Faverolle Cockerel and Hen. 3. Breeding Stock. One and two-year-old hens.

A drawback to successful poultry development is often met with in the enthusiast who establishes a plant, buys a number of birds and then writes for information as to proper methods of management and feeding, which should have been first thoroughly learned. A letter received some time ago may be quoted as a case in point. It is is as follows: 'DEAR SIR,—I recently had opportunity to purchase at a bargain one hundred Barred Plymouth Rock pullets and I did so. Will you please tell me how to successfully manage them.—J. M.'

It is hardly necessary to say that in such a case successful results are not likely to follow, and then poultry keeping is at once declared non-profitable.

Another drawback is the practice—frequently on the part of farmers—of keeping more fowls and the hatching of more chickens than can profitably be managed or reared. In report of last year methods of procedure calculated to lead to successful poultry keeping by farmers were given at length. It may be admissible to repeat in this connection, a suggestion made in that report to the effect that 'farmers should keep no more fowls than they can manage profitably, nor should they attempt to rear a greater number of chickens than circumstances will permit of their bringing to saleable age as early in the season as is possible.'

Another too common practice on the farms of the country and which retards poultry development—from winter eggs and better quality of flesh standpoints—is the keeping of 'scrub' stock. Doubtless the practice is not so general as it was, but it should be abandoned. It has been shown in previous reports that 'scrub' poultry are neither as good winter layers as pure bred birds, nor do their chickens make as valuable table fowls. Why have them? It is to be remembered that the cost of feeding a pure bred fowl is no more than that of the nondescript of much less value.

FACTORS IN THE PRODUCTION OF THE SUPERIOR QUALITY OF POULTRY.

More particularly in regard to the superior quality of poultry there is found, as in the case of winter eggs, a far greater demand than there is supply. The demand is from both home and foreign market. That a superior quality of poultry suited to the most exacting tastes of home, or, British market can be produced by the farmers of the country has been demonstrated by the number and quality of the chickens grown in our poultry department and many of which have been killed, dressed and exhibited at farmers' institute meetings, fairs, special meetings and poultry exhibitions throughout the country for many years past.

It has been urged upon our farmers with almost unvarying monotony that not only may they have the desirable chickens of plump and inviting appearance but also excellent winter-laying fowls by their conforming with the following essential conditions, viz.:—

The proper breeds.

Proper management and feeding of the same.

Proper care of the chickens from time of hatching to the saleable age of 3, 3½ or 4 months.

As to suitable breeds it has been shown that no mistake can be made in choosing one of the following varieties, viz.: Barred or White Plymouth Rocks, White Wyandottes or Buff Orpingtons.

Of these varieties and their dual qualifications as egg and flesh producers and the proper caring of their chickens, so as to have the acceptable market type as early as possible, detailed information is given in succeeding pages.

A DETRIMENTAL PRACTICE.

A practice which seriously retards the quicker and greater production of the superior type of market chickens is that of using a Leghorn, Andalusian or Hamburgh

male with pure bred or mixed fowls of larger size, presumably with the object of havi better layers. While such a course may be permissible from an egg standpoint, it not advisable for farmers to adopt, who have the dual requirements of eggs and bet quality of chickens in view. The result is sure to be chickens of smaller size a much less value than those of the English or American utility breeds. Speaking the writer on this subject, some months ago, the manager of an extensive purchasi poultry firm of Toronto said 'that the farmers of the country should be stron urged to abandon the too prevalent custom of using male birds of the Mediterran breeds for breeding or crossing purposes. We get,' he said, 'so many small chick of Leghorn or Andalusian cross that we suffer serious loss. These chickens are s with others and we do not like to refuse them. They cannot be shipped to the Engl dealers and we cannot put them on the local markets as good quality, so we are g take what we can get for them.'

Occasionally a case is met with where birds of a large 'first' or 'mixed' cross kept, and results in winter eggs and large chickens are said to be satisfactory. Inqu generally elicits the information that all the good points in these fowls are owing the use of pure bred males of the large breeds, thus conveying the moral that the nea to the pure breeds the better the birds. In connection with 'first crosses' it must not forgotten that unless the cross is made every year, by the introduction of new blood is apt to degenerate into the nondescript.

WHAT HAS LED TO INCREASED PRODUCTION.

Although not in proportion to the demand there has yet been an increase of p duction in both winter eggs and better quality of poultry. It may be interesting note some of the incentives which have led to past, and are likely to lead to s greater future production, viz :—

1. A rapidly increasing demand with continued high price.

2. A better appreciation by farmers of poultry as money makers.

3. Results of tried and successful practical methods given in Experimental Fa reports for the past seventeen years.

4. Practical instruction at farmers' institute, agricultural or special meeti from different sources.

5. Greater attention to and the devoting of more space to poultry matters by ag cultural papers.

6. Increased railway facilities whereby the higher price markets may be reached

HIGH PRICE OF EGGS LAST SUMMER AND AUTUMN.

A remarkable feature of last summer's poultry and egg trade was the high pr of new laid eggs throughout the country, but more particularly in city markets. D ing the months of July and August last, a period heretofore of lowest prices, new l eggs were worth from 18 to 20 cents per dozen, the value gradually rising until 25 ce were obtained for them in September and 30 cents in October. Speaking of this u usual state of affairs, the Toronto *Telegram*, of 19th October last, says : 'What householders of our city want to know is why they have to pay 30 cents per dozen new laid eggs at this season of the year ?' And then follows the statement that reason may be found in the changed methods of management on the part of ma farmers, by which the moulting of their hens in summer is brought about with view of having them winter layers. And such explanation, so far as it applies, is u doubtedly correct, for as soon as 'bringing on the moult' during the summer is g

erally practised by farmers, new laid eggs in autumn will surely be in less supply. The moulting period, which occurs once every year, is really one of non-production, and it is only wise to have it at the time of year when values are at their lowest. In the poultry department—Experimental Farms Report—for 1896, page 288, full information is given as to how early moulting for some years previously had been brought about, and farmers are advised to adopt a similar course. In 1901 report the subject is again referred to.

It is quite likely that the shortage of eggs during the autumn months will be followed by an increased winter egg production, and as a probable consequence a slight lowering of prices during that season. Should this take place, the experience of recent years tends to show that any falling off in winter values will be compensated for by increased prices during the moulting period. It is quite possible that a more uniform all-the-year-round price for the new laid article may be the ultimate result.

A QUESTION AS TO POSSIBLE LOWER PRICES.

The question is now being asked : 'Has experimental research shown any likelihood of lower prices in the near future ?'

In reply to this it may at once be said : 'Not as long as the demand is greater than the supply, as it is at present.'

So far instruction from our poultry department, and which is warranted by experience, has been in the way of showing farmers the best and cheapest ways and means of obtaining eggs and the superior quality of poultry at such seasons of the year as will bring them the highest prices. In this connection, observation has shown that there is greater likelihood of a larger and more immediate supply of new laid eggs in winter than of the superior quality of market poultry in later months. For the reason that so many farmers have more time in winter to care for their laying stock (and which attention is absolutely necessary) than they have in the spring and early summer to devote to the hatching and rearing of chickens. This phase of the subject is fully discussed in poultry department report for last year, 1902.

WHAT BREEDS EXPERIENCE HAS SHOWN AS BEST FOR FARMERS—PREVIOUS INSTRUCTION CONFIRMED.

Much experience has been gained since the first report of this department was issued seventeen years ago. Better methods of management and the more effective application of different rations have made themselves evident from time to time, and have been noted in previous reports. But it has not been found necessary to recommend any other than certain breeds which, from the first, have proved themselves best suited to the requirements of the farmers, as winter layers, and the progeny of which make quick growing chickens. Rather has experience shown that a more general adoption of such breeds would be followed by still better results. The fowls of Plymouth Rock and Wyandotte breeds have always been advocated as essentially 'utility breeds' for farmers, because experimental handling of them for many years has proved them to be such. To-day these breeds are placed by practical authorities at the head of the list of fowls best adapted to the wants of the farmer. Other breeds have come to the fore in recent years, notably the Orpington family of English origin, with its numerous varieties, and each with strong claims as prolific egg layers and flesh makers of acceptable market type. We have also Rhode Island Reds, from the eastern states of America, with strong claims from utility standpoints. These breeds are now on their trial. If they have the merit claimed for them, they will take rank with the best. If they cannot hold their own in competition with the other standard breeds named no sentimental regard or 'bolstering up' will be found sufficient to keep them from a

lower rating. It is a matter of congratulation that it has not been found necessary to make any change in the advice given as to the breeds best adapted to the requirements of the farmer. To have recommended change without reason would have been to confuse rather than benefit.

STRAIN ALL IMPORTANT.

The importance of *strain* has made itself apparent in no uncertain manner. Letters received from many points of the country show that much of the disease among poultry in recent years may be traced to inbreeding and the resulting lack of constitutional vitality. This has made itself very evident in the case of turkeys, the mortality among which in all parts of the country is much greater than it should be. In summing up the results of an egg laying contest held in England some months ago, the secretary of a leading poultry association of that country remarks 'that the value of strain made itself more evident than ever. It did seem as if strain was as important, if not more so, than breed.' Such being the case, farmers who purchase eggs for hatching, or stock to breed from, should ascertain that both are from strains of noted worth.

THE EXPERIMENTAL WORK OF THE YEAR.

Experience has shown that in order to have hens lay early and well during winter it is necessary that they should moult during the summer months. The numerous inquiries received from time to time, as to how this is accomplished, shows growing appreciation of the importance of the event. A description of the methods which have been sucessfully adopted in our department for the past and several previous summers will best convey the information as follows : 'The sale of eggs for hatching purposes being over during the first week in July the male birds were removed from the breeding pens to another building containing small compartments with outside runs. The breeding stock as well as all other hens were then allowed to run promiscuously in fields in rear of the poultry buildings where there were grass, clover and shade, three important essentials. At this time the rations were reduced to half quantity. The effect of this was immediately to very much reduce and ultimately to almost entirely stop egg production, which was the desideratum. The half rations were continued for two weeks when full quantity was resumed as follows : Mash composed of coarsely ground oats 2 parts; shorts 1 part; gluten meal 1 part with beef scraps in proportion of one pound to 15 fowls. The mash, which in summer was mixed with cold water was fed three times per week. At times a small quantity of linseed meal was added. The beef scraps were used in lieu of cut green bones because it was not convenient to procure the latter. If mash was fed in the morning wheat, or oats or both mixed were given in the afternoon, or, *vice versa.* On such days as mash was not given grain took its place. An excellent summer grain ration is composed of buckwheat and oats mixed. Pure water should always be in abundant supply. In response to this treatment results have always been satisfactory and by the end of September or beginning of October the hens have looked remarkably well. The advice of Dr. Sanborn, a well-known poultry authority, in reference to the moulting period is valuable enough to warrant its repetition. He says: 'A moulting hen is easily fattened. Hence at this period feed lightly of those foods which produce fat. Corn, cornmeal, middlings, potatoes must be used sparingly. Increase the amount of green bone, bran and skim milk. A run in a field of clover will be a help. Keep all males by themselves during the moulting period. Shelter the hens from storms or cold rains. The ideal place for a run is an apple orchard where, in addition to the grass, may be found insects in the fallen fruit, &c. Birds should go into the moult not fat, free from lice and with no red mites in the house.'

EARLY FALL WORK—HANDLING THE PULLETS.

No effort was made to stimulate the hens to lay during October. What eggs there were came from early hatched pullets which, with the other chickens hatched during the season, were kept in location some distance from the older stock. Experience has shown the advisability of keeping the pullets away from the hens of older age. For the reason that the quantity of stimulating food that would be positively beneficial to the pullets would make the more mature laying stock—notably of the heavy breeds—too fat. And the object of every experienced breeder is to avoid such disaster as having his prospective layers go into winter quarters in an overfat condition. It is to be borne in mind that it is far easier to prevent than to remedy an overfat condition. In a previous page it is stated that one of the drawbacks to a greater supply of new laid eggs during winter is a lack of knowledge or appreciation of certain essentials necessary to success. Here is one of these details met with at the beginning of the season of highest prices. If the prospective layers through mismanagement, or, carelessness are allowed to become too fat, it is a matter of weeks to get them into proper condition. The dividing line between too much and too little is very fine. He who knows the happy medium makes the profit. Only a thorough knowledge of conditions and close observation of symptoms will show where the line is to be drawn.

WHEN THE PULLETS BEGAN TO LAY.

The pullets which had been well-fed and cared for from time of hatching, began to lay at age and dates as follows :—

B. P. Rock pullet hatched April 14, laid October 5.

L. Bra-P. R. Cross pullet hatched April 17, laid October 25.

W. P. Rock pullet laid November 19.

Buff Orpington pullet laid November 27.

Faverolle pullet laid November 17.

COMMENCEMENT OF WINTER LAYING

In the early part of November last the first snow fell and remained. The fowls were, in consequence, placed in different pens according to variety. Experience has shown that where a number of fowls are kept in different compartments, when once placed they should be allowed to so remain. Moving them from one place to another has always been found detrimental to early or steady laying. This is known to experienced breeders, but beginners are sometimes apt to indulge in the practice. Winter laying may be said to have begun on the 18th November and was fairly general by the end of the month, when 30 to 37 eggs were laid per day, the number increasing as the month became older. The first fowls to begin laying after moulting were :—

Barred Plymouth Rock, hens and pullets ; White Plymouth Rock, hens and pullets ; Buff Leghorn, hens and pullets ; Faverolle, hens and pullets ; Buff Orpington, hens and pullets; Buff Plymouth Rock, hens and pullets.

TESTING FERTILITY AND STRENGTH OF GERM.

During the months of March and April for some years past investigation has been made with the view of discovering, if possible, the cause, or causes, of so many weak germs found in eggs laid at the latter part of winter, and early spring by hens

which were confined to limited quarters in the farm poultry houses. The houses were artificially heated to a moderate temperature, varying from 30 in cold weather to 50 degrees on mild days. The fowls had been gently stimulated to lay, but with no condiment, and had laid fairly well. But these eggs when hatched out in late March or April by incubator or hens, produced few chickens. The eggs on being tested showed a fairly satisfactory percentage of fertility, but on examination, after the hatch was over, a great many chickens were found dead in the shell, the majority of them, at the 'pipping' stage.

With the view of obtaining further *data* a number of pens were mated up on the fowls going into winter quarters. Tests heretofore had been made towards the end of the winter season. The object on this occasion was to test the fertility and strength of germs of eggs laid early in December and before the hens had become enervated by long laying or confinement. Accordingly on December 20, 181 eggs of different breeds (enumerated further on) were placed in an incubator. On the 26th instant 18 clear eggs (i.e., without germs) and 6 with partially developed germs, were removed.

On January 1 (eleven days from date of placing eggs in incubator) a further test was made with the following results:—

Barred Plymouth Rocks—46 eggs showed 69 per cent fertility.

L. Bra-B. P. Rock Cross—54 eggs showed 90 per cent fertility.

Rhode Island Reds and White Plymouth Rock—49 eggs showed 61 per cent fertility.

Buff Leghorns—8 eggs showed 26 per cent fertility.

The rapidly developing germs presented a strong and healthy appearance. This was confirmed by later examination. An unfortunate accident to the incubator two days before the chickens were due resulted in the death of all but 26, which, however, hatched out apparently strong and healthy.

Further experimental tests were made with eggs laid from time to time during the balance of the season and confirmed the conclusions of previous years. These conclusions showed that the longer and closer the term of artificial life of the laying stock the greater was the weakness of the germs. In report of 1901, a mistake frequently made, that of speaking of fertility and strength of germ as of one and the same significance, is pointed out. Experience has shown, with no uncertainty, that it is one thing to have a high percentage of fertility and another to have results in a corresponding number of robust chickens. It is the strong and lively chicken which will make rapid growth, that is wanted. It has been shown by experiment that the germs in eggs from hens closely confined to winter quarters, but laid in spring time, although showing a high percentage of fertility, did not result in many chickens. The germs had died in different stages of development, the greatest number when fully developed, or at the 'pipping stage.' And in many cases the chickens which came out proved weaklings. As warranting the foregoing conclusions, the following results of experimental tests are given:—

On March 27 last (1903), 202 eggs of different breeds (described further on) were placed in one of the most reliable incubators on the market. The result was 39 chicks. The eggs placed in the incubator were laid probably during the third week of the month named, and by hens which were kept in artificially, but moderately heated compartments of our poultry houses. The fowls had received generous rations with a view to egg production, and had laid fairly well for the most part of the previous winter. The following table shows a fairly satisfactory percentage of fertility, but an unsatisfactory number of chickens hatched:—

RESULTS from Early Spring Eggs laid by hens kept in warm houses during winter. Put into an Incubator on 27th March, 1903.

Discription of Eggs.	No. of Eggs put in Incubator.	Eggs Tested Out.	No. of Chickens Hatched.	Eggs which did not Hatch.	Examination of Eggs which did not Hatch and Results.
Rhode Island Reds......	31	10	7	14	Of these one was found clear; remainder contained fully developed chicks dead in shell.
Barred P. Rocks........	29	5	2	22	1 egg apparently without germ; 21 eggs with fully developed chickens dead in shell.
White P. Rocks.........	38	15	11	12	1 egg without germ; 11 chicks dead in shell at pipping stage.
Silver Gray Dorkings ...	34	12	7	15	Eggs with germs dead at various stages of incubation.
White Wyandottes......	20	6	8	6	1 egg without germ; remaining eggs contained well developed chickens dead in shell.
Buff Orpingtons.........	26	9	1	16	2 eggs found without germs; remaining eggs with germs dead in more or less advanced stages of incubation.
L. Bra.-B. P. Rock cross.	24	5	3	16	Unhatched eggs in different stages of incubation.
Total.......... ..	202	62	39	101	

The above table shows a large number of unhatched eggs, which, upon examination, were found, in the great majority of cases, to contain chickens fully developed but dead, presumably too weak to break their way out of the shell, a very discouraging result certainly. Under similar circumstances, the first conclusion would be, on the part of the inexperienced, to blame the incubator. But if it hatched 39 chickens, was it not as capable of hatching out more, if germs were as strong in the unhatched eggs as in those which produced chickens?

SIMILAR EGGS UNDER HENS AND RESULTS.

In order to ascertain results with hens as hatching mediums, on the same day as the incubator was started, three Faverolle hens, which were broody, were given 13 eggs each. The eggs were of the same kind and age as those put into the incubator, as follows:—

Description of Eggs	No. of Eggs Set.	No. of Chicks Hatched.	Remarks.
Barred P. Rock..........	13	1	Eggs were hens' and pullets'. On testing all eggs showed fertility. Examination of eggs which did not hatch showed 8 with fully developed chicks dead in shell at 'pipping' stage; 3 eggs with premature germs; 1 egg was missing.
White Wyandotte........	13	6	Hens' eggs; 2 clear eggs were tested out; 1 fully developed chick was dead in shell; 2 eggs were missing, probably broken in nest; 2 chicks were crushed by hen in nest.
Rhode Island Reds.	13	8	Hens' eggs. On testing one egg was found to contain dead germ; 1 egg was accidentally broken. Examination of eggs which did not hatch showed 2 fully developed chicks dead in shell; 1 egg with partially developed germ.
Barred P. Rock..........	13	2	This hen was set on April 4th, a week later than the preceding ones. On testing 3 clear eggs were found. Remaining 10 eggs all showed fertility. Examination of unhatched eggs showed that two fully developed chicks had been crushed in nest by hen. Remaining 6 eggs contained dead germs.
Total	52	17	

As compared with results from the incubator this showing is in favour of the hens, but the average experience of several years past does not point to much difference between incubator or hen when conditions are equally favourable to both.

RESULTS FROM EGGS LAID BY HENS IN COLD HOUSES.

The above results, it will be borne in mind, are from eggs laid by hens which had been kept in warm houses and given rations calculated to gently stimulate egg production during winter. It will be interesting, then, to compare these results with those from hens which had not—nor had their parent stock—known what warm winter quarters were. Fowls which were kept under such conditions as are to be met with in the majority of farm-yards throughout the country. Certain conclusions are noted in report of last year. Investigation was continued last winter and spring, as follows:—

On the 11th of last March 13 eggs laid by Buff Orpington pullets from hardy stock—as described above—were set under a B. P. Rock hen. On 2nd of April 10 chickens hatched. On eggs being tested, one clear egg was found. Examination of the two eggs which did not hatch showed two embryos, which had probably died about fourteenth day after eggs were put under hen.

On March 21 (ten days later), 13 eggs, also laid by Buff Orpington pullets, were placed under another B. P. Rock hen. On 11th April, 11 chickens hatched, one chick was crushed in nest by the hen. Examination of the remaining egg showed a fully developed chick dead about 'pipping' time.

On March 21 (same day), 13 eggs of Buff Orpington pullets were given to a Langshan hen. Result, 11 chicks.

The most convincing results were obtained from 16 eggs (half Buff Orpington and half B. P. Rock pullets), which on March 9 were placed under a large hen, and in due course every egg hatched. And what was further satisfactory, every one of the 16 chickens lived and made rapid growth.

The total of 48 chickens from 55 eggs laid by pullets, which had been kept in cold winter quarters—as had their parent stock—and which had been good winter layers, is in favourable contrast with 17 chickens from 52 eggs laid by fowls which had been kept in artificially warmed poultry houses.

It is also an effectual answer to the statement, sometimes made, that strong germs cannot be had in early spring time from hens which have laid steadily during the winter.

To farmers, particularly those in parts of the Dominion where the winters are rigorous, these results are important, as they are strikingly in favour of fresh air and plenty of it, even if it is cold.

They are doubly important, as giving proof that with intelligent effort it is possible and profitable to build up strains of fowls to suit winter conditions, rather than to attempt making winter conditions suit the fowls.

SUMMARY OF EXPERIENCES GAINED RE FERTILITY AND STRENGTH OF GERM OF EGGS LAID IN WINTER.

A summary of the experiences gained in connection with the testing and hatching results of eggs laid during the cold season under conditions described, in detail, in foregoing pages may be given as follows:—

1. The generous and gently stimulating rations given to the fowls kept in cold houses did not seem to affect the strength of the germs of the eggs laid by them, as similar rations apparently did in the case of the hens kept in artificially warmed quarters.

2. Eggs laid in early December by the hens in artificially warmed houses showed a greater percentage of strong germs than did eggs laid by them later in the season.

3. Eggs laid by the same hens in early spring showed a satisfactory percentage of fertility, but the weakest germs.

4. The most striking and gratifying results were obtained from the fowls which, like their parent stock had never known warm quarters. From 55 eggs laid by these fowls in early spring—after laying well during the winter—48 strong chickens were hatched. In contrast with this are 17 chickens from 52 eggs laid by hens kept in warmed, but comparatively limited quarters.

5. Results were strongly in favour of the average farm conditions, such as were described by Mr. Wm. Moe, of South Franklin, Que., on page 318 of 1901 report. Mr. Moe has an open shed attached to his poultry house, and to this shed, which is protected by a curtain in stormy weather, his fowls have access, so obtaining fresh air and exercise. The latter is secured by throwing grain in litter which is always on the floor of the shed.

HOW THE HENS WERE SET.

Although incubators are becoming more general in use, there are yet a number of persons who use hens as hatching mediums. To them the following method as adopted in the poultry department of the experimental farm will be found useful. During the early part of the season several hens became broody, presumably those which had laid well during winter, and they were given eggs. Wooden boxes, without bottoms, and with a hinged door in front, were used to place the sitters in.

These boxes should be roomy and need not be expensive. At the bottom of the box a comfortable nest was made, preferably of oat straw, which was well dusted with insect destroying powder. Three or four imitation eggs were placed in the nest and the sitter, which was also well dusted with powder, was placed on the eggs. She was allowed to remain on these eggs for 24 or 36 hours. The object in so doing was to destroy any vermin that might have been on hen, or in the nest. A lice-infested fowl will not make a good sitter. Should she succeed in bringing out a number of chickens they will likely be seized upon by the lice and will soon dwindle away. Scores of chickens are lost every season in this way, and the cause attributed to any but the right one. Two or three times during the incubating period the sitter should be dusted under the wings, in the fluff and back of the neck with lice-destroying powder. In the case of borrowed sitters some such measures are absolutely necessary. Food, in the shape of mixed grains, water and grit were supplied regularly every day. In the morning the doors of the nest boxes, which had been closed from the previous day were opened, and the sitters allowed opportunity to get to food and drink. Where there are valuable eggs they should be examined every morning when the sitter is off the nest. If any have been broken the remaining eggs should be carefully washed in lukewarm water and returned to the nest, which should also be thoroughly cleansed. In early spring, when the weather is yet cool, the sitter should not be away from the nest longer than eight or ten minutes.

INCUBATORS.

With all incubators are sent full instructions as to their proper management and care. Instructions as to care and feeding of the chickens accompany all brooders, which are generally purchased with the incubator and from the same maker. As is generally known, the chickens, 36 hours after being hatched in the incubator, are removed to the brooder where they will remain until fully feathered, when they will be removed to other quarters. The brooder is really the foster-mother, as it is called in England. The chickens are hatched in the incubator and reared in the brooder.

EGGS SET AND CHICKENS HATCHED.

The following table shows the number of eggs set and chickens hatched. It also gives description of the eggs which did not hatch—as learned by examination after the other eggs had hatched out chickens.

EGGS SET AND CHICKENS HATCHED. DESCRIPTION OF EGGS WHICH DID NOT HATCH.

When Eggs were Set.	Description of Eggs.	Hens or Pullets Eggs.	When chicks were Hatched.	Number of Chickens.	Description of Sitter.	Results of Examination of Eggs during and after Hatching.
1903.						
March 5...	13 Buff Orpington eggs....	Pullets.....	March 26.	5	Buff Orpington	Eggs from Winchester, Ont. Tested out 4 clear eggs. 1 with germ just started. 3 contained half developed germs.
" 11...	13 " "	"	April 2.	10	B. P. Rock hen. ...	Eggs were from hens kept in cold houses with run in shed. Only 3 eggs did not hatch. 1 of these was clear. 2 others contained embryos dead at 14th day.
" 21...	13 " "	"	" 11.	11	" "	Eggs from hens kept in cold house but with run in shed. 1 chick crushed in nest. 1 egg contained fully developed chick but dead.
" 21...	13 " "	"	" 11.	11	Langshan hen.......	Eggs from hens kept as two previous ones. 1 egg broken by hen. 1 chick crushed in shell.
" 24...	13 " "	Hens.......	" 14.	5	Buff P. Rock hen....	These hens were probably a little fat. They were kept in a cold house, but did not lay as well as pullets. 2 eggs were clear. 2 were addled. 1 contained fully developed dead chick. 3 with partially developed germs.
" 24...	13 B. Plymouth Rock eggs..........	Pullets.....	" 14.	8	" " ...	From fowls kept in cold house as previous ones. Examination showed 3 clear eggs. 1 chick crushed in shell. 1 egg missing.
" 27...	13 " "	Both.......	" 17.	1	Faverolle hen.......	Eggs were from hens kept in an artificially heated house. On examination 8 eggs were found to contain 8 fully developed chicks dead in the shell about pipping. 1 egg was missing. 3 contained immature germs.
" 27...	13 " "	Hens.....	" 17.	6	" "	Hens kept in warm house. On testing 2 eggs were found clear. 2 chicks crushed in nest. 1 dead in shell. 2 eggs missing.
" 27...	13 Rhode Island Red eggs....	"	" 17.	8	" "	In testing 1 egg accidentally broken. 1 with dead germ. After hatching 2 fully developed chicks dead in shell. 1 partially developed.
April 4...	13 B. Plymouth Rock eggs..........	"	" 25.	2	Orpington hen......	On testing 3 eggs were found clear. All remaining eggs contained apparently strong germs yet results were poor, showing weak germs. 2 chicks were killed by hen. Remaining eggs contained dead germs.
" 9...	13 Jubilee Orpington eggs....	Pullets....	" 30.	3	" "	Eggs were imported from New Jersey. Were shaken up in transit. 1 egg broken. 1 chick dead in shell. 4 eggs addled. 4 chicks crushed in shell by hen.
" 9...	13 " "	"	" 30.	5	R. I. Red hen......	2 eggs were broken. 5 eggs were addled. 1 chick dead in shell. Eggs came by express from New Jersey.
" 11...	13 " "	"	May 1.	5	Buff P. Rock hen....	On examination 3 eggs were found addled. 5 eggs were missing.
" 12..	13 Brown Leg—B. P. R. cross eggs ..	"	" 2.	12	S. G. Dorking hen..	Only 1 egg did not hatch. Hens having had run outside for some time germs had become strong.

"	16...	13 B. P. Rock eggs.............	"	"	7.	7	White P. Rock pullet	Eggs came from Moosomin, N.W.T., and were probably much shaken up. 1 egg was clear. 1 addled. 1 missing. 3 with partially developed germs.
"	16...	13 "	"	"	7.	3	Buff Rock hen......	Eggs from Moosomin, N.W.T. Probably shaken up *en route.* 5 clear eggs. 3 with dead chicks. 1 addled. 1 egg missing.
"	16...	13 Buff Orpington eggs..............	Hens.......	"	7.	3	S. G. Dorking pullet	Old male bird mated with hens. Result 10 clear eggs.
"	20...	13 Black Minorca eggs...............	"	"	11.	9	Faverolle hen.......	1 egg with fully developed chick dead in shell. 2 chicks crushed in shell by sitter. 1 egg addled.
"	30...	13 Brown Leg—B. P. R. cross eggs ..	Pullets......	"	21.	9	White Wyandotte hen	2 chicks killed.
May	7...	11 White Leghorn eggs..............	"	"	28.	5	B. P. Rock hen.	On testing eggs, which came from Myrtle, Ont., 5 were found to be clear. 3 eggs were broken, thin shells.
"	7...	13 Silver G. Dorking eggs.	"	"	28.	6	S. G. Dorking hen ..	On examination 7 eggs were found with germs in different stages of development.
"	7...	5 B.P.R.-5 W.Wy.-3 Buff P.R. eggs	"	"	28.	13	W. P. Rock hen	All eggs hatched.
"	11...	13 Buff Orpington eggs...........	"	June	1.	9	" "	Eggs from Winchester, Ont. 1 egg was found clear. 2 with germs partially developed. 1 egg broken.
"	12...	8 Buff Orp.—5 B. P. Rock eggs.....	Hens.......	"	2.	8	B. P. Rock hen.....	On testing all eggs seemed fertile. On examination after hatching 2 eggs were found which did not hatch. 1 chick was crushed in the nest. 2 eggs were missing.
"	23...	13 Buff Orpington eggs.............	Pullets......	"	13.	11	W. P. Rock hen	On examination after hatching 2 eggs were found addled. These eggs were obtained from Mr. J. S. Allen of Ottawa.
June	5...	15 Assorted eggs....................	Both.......	"	26.	5	B. P. Rock hen.....	Bad sitter. 3 chicks killed by hen. 2 eggs were broken. 5 eggs contained partially developed germs.
"	15...	15 Faverolle eggs.............. ..	Hens.	July	6.	9	" "	2 eggs were addled. 2 chicks died in nest. 2 chicks were crushed in nest.
"	16...	13 White Leghorn eggs..	"	"	7.	9	" "	2 chicks dead in shell. 2 eggs were broken. These eggs came from Myrtle, Ont.
"	16...	13 " "	"	"	7.	8	" "	2 eggs were broken by hen. 2 chicks died in shell. 1 egg did not hatch. Eggs came from Myrtle, Ont.
"	16...	13 Jubilee Orpington eggs...	"	"	7.	9	....	Eggs came from W. P. Willett, East Orange, N.J. 4 eggs did not hatch.
Eggs set..		392 Chickens hatched............	....	....		215		
		Incubator Hatched Chickens.	....	....		157		
						372		

From above table it will be seen that the germs of the eggs laid by hens which were confined to limited quarters in artificially warmed houses, during the winter season, did not become strong enough to give a satisfactory percentage of robust chickens until they had run outside and recuperated from their term of indoor winter life. As was the case last year, this seemed to be about the middle of April.

PROGRESS OF THE CHICKENS.

On the chickens being hatched out, if by incubator, they were placed in brooders outside. If by hens they were put with their mother hens, in coops with slatted fronts on the grass in front of the poultry buildings.

The coops were so arranged that they could be securely fastened at night, while ventilation was provided for. The little doors which closed the front of the coops at night made convenient and clean platforms whereon to feed the chicks during the day. Through the slats the chicks could run on the grass, while the hen remained inside. Sand or dry earth to the depth of two or three inches was placed on the floor of the coop. On taking the mother hen from the nest, she was given food and water. She had probably been on the nest, bringing out her chickens, for 36 hours, and required both. Any little attention at this time to the sitter is well bestowed, for it is well known to poultry-raisers that a well-fed mother is likely to brood her chickens satisfactorily. It is most important that the chickens should be well brooded, as well as carefully fed and looked after during the early period of their lifetime. The same rations as used in previous years for brooder and hen-raised chickens were given last season, viz.:—

First few hours very little food is required. If the hen has been well fed, as suggested, she will be inclined to brood her chicks. This is desirable, particularly in the early part of the season. A few stale bread crumbs will be all the food required.

Next day.—Give stale bread soaked in milk and squeezed dry. Feed a little at a time and leave none on the platform. A little hard boiled egg finely cut up may be added with benefit.

Continue this for a day or two and add granulated oatmeal or finely crushed wheat. Many persons feed finely crushed wheat from the first, and with success.

At the end of ten days crushed corn was given. Whole wheat was not fed till after twelfth day and then a little at a time.

As the chicks grew older, they were fed a mash composed of stale bread, shorts, cornmeal, ground meat, &c. A small quantity of finely cut bone was eaten with avidity and with benefit. Skim or sweet milk and water were given for drink.

On the chickens becoming fully feathered, the mother hens were placed with the others and the chicks returned to their coops as usual, and were allowed to remain in them until removed to more commodious quarters in the shape of a colony house, or one of the small pens in No. 2 house.

WEIGHT DEVELOPMENT OF CHICKENS.

Fed and treated as above, the chickens of the different varieties made the following weight development:—

	Lbs.	Oz.
Barred P. Rock Cockerel at 2 months, 3 days of age......	1	12
" " " "	1	7
" " 3 months and 6 days of age ..	3	0½
" " " " ..	2	15½
White P. Rock Cockerel at 2 months, 3 days of age......	1	12
" " " "	1	9
White Wyandotte " " "	1	8½
" " " "	1	7

	Lbs.	Oz
Rhode Island Red Cockerel at 2 months, 3 days of age	1	10
" " " "	1	12
Buff Orpington " " "	1	12
" " " "	1	9
" " 4 months of age..........	3	15½
" " " "	4	8

CROSSES.

Light Bra.-B.P.R. (2nd cross) Cockerel at 2 mos. 3 days of age.................................	1	13
Light Bra.-B.P.R. (2nd cross) Cockerel at 4½ mos. of age..	4	14
" " " " ..	4	6
Bro. Leg.-B.P.R. Cross Cockerel at 2 mos. 3 days of age..	1	10½
" " " " ..	1	5
" " " 3 mos. of age	2	15
" " " "	2	6
" " " 4 mos. of age......	4	7
" " " "	4	4½

JUBILEE ORPINGTONS.

The Jubilee Orpingtons are a new variety of the Orpington family, and were originated by Messrs. Cook & Son, the well known poultry breeders of Kent, England, who are also the originators of the Buff Orpingtons. It is claimed for the Jubilee Orpingtons that the cockerels made rapid flesh development and are acceptable market types at 3 and 4 months of age. It is claimed for the pullets that they are early and good winter layers.

From settings of eggs obtained from Mr. W. P. Willett, of East Orange, N.J., U.S.A., the agent of Messrs. Cook, several chickens were hatched. The weight development of some of the cockerels were as follows:—

	Lbs.	Oz.
Jubilee Orpington Cockerel at 2½ months......	2	2½
" "	1	14
" "	1	14
Jubilee Orpington Cockerel at 3 months....	2	15
" "	2	6
" "	2	4½
Jubilee Orpington Cockerel at 4 months....	3	15
" "	3	4

Another variety of the Orpington breed, named Spangled Orpingtons, has recently been originated, and is exploited as a remarkably promising type of early market chicken.

In the foregoing account of the weight development of chickens of the different varieties named, it may be said that they were in no way forced beyond being regularly fed on rations as described, were well cared for and their coops cleaned every day. When about three months of age several of their number were handed over to the chemical division for fattening experiments on different rations. A detailed account of these experiments by Mr. F. T. Shutt, chemist, will be found in a subsequent page.

EGGS LAID FROM DECEMBER TO JUNE 30.

The following table will show the number of eggs laid by different breeds and their varieties during the months of highest prices. In some cases hens were kept over

for breeding or hatching purposes. In others some of the pullets were late, but commenced to lay in the spring when other hens were becoming broody. Experience has, however, shown that it is best for the farmer to keep over the winter the pullets that are likely to make early and continuous layers during that season.

EGGS laid by different breeds from December 1, 1902 to June 30, 1903.

Breeds.	1902. December.	1903. January.	February.	March.	April.	May.	June.	Totals.	Remarks.
8 White Leghorn hens...	84	71	63	113	126	111	68	636	
10 Black Minorca " ...	64	77	65	128	167	169	62	732	
7 Brown Leghorn " ...	42	31	42	107	116	99	40	477	
12 Langshan " ...	158	135	103	141	120	128	105	890	As the hens of the sitting varieties became broody they were given eggs, as shown in table of eggs set and chickens hatched.
30 Barred P. Rock " ...	225	202	142	260	285	234	165	1,513	
18 " pullets	85	153	126	222	201	182	65	1,034	
15 White P. Rock hens...	120	98	75	141	141	124	111	810	
14 " pullets	82	146	146	164	182	157	75	952	
4 Buff P. Rock hens.....	59	94	64	71	32	32	31	383	
12 White Wyandotte hens	113	112	86	133	126	81	69	720	
4 " pullets	45	75	55	81	35	Brdy.	......	291	
15 Buff Leghorn hens.....	71	38	28	106	116	95	55	509	
3 Buff Orpington hens...	45	50	34	33	50	Brdy.	......	212	
13 " pullets.	35	94	103	107	133	174	118	764	
12 Rhode I. Red hens	126	158	129	180	131	134	95	953	
6 Faverolle hens	67	97	93	73	63	29	39	461	
9 Mixed hens.	57	47	47	127	169	116	44	607	
7 White Ind. Game hens.	...	29	9	17	77	47	31	210	
8 White Leghorn pullets.	.....	55	70	132	126	93	44	520	
11 Silver G. Dorking hens.	50	132	115	115	94	75	42	623	
15 L.B. B.P.R. cross pullets	174	113	88	191	189	168	69	992	
	1,702	2,007	1,683	2,642	2,679	2,248	1,328	14,289	

EGGS LAID DURING THE YEAR.

The number of eggs laid during the different months of the year are as follows:—

1902.

December	1,702

1903.

January	2,007
February	1,683
March	2,642
April	2,679
May	2,248
June	1,328
July	857
August	482
September	386
October	106
November	346
	16,466

LIST OF STOCK IN POULTRY BUILDINGS.

During the month of November, a number of the old and young birds were disposed of and others of different varieties were purchased instead.

The list of stock on hand at the end of the year and their disposition is as follows:—

Pen.	——	Females	Males.
1..	Barred Plymouth Rock hens	10	1
2..	" " "	10	1
3..	White Plymouth Rock hens	10	1
4..	Buff Orpington Rock hens	6	1
5..	White Wyandotte hens	10	1
6..	Silver Grey Dorking hens	10	1
7..	Black Minorca hens	9	1
8..	White Leghorn hens	10	1
9..	Buff Leghorn hens	10	1
10..	Buff Plymouth Rock hens	4	1
11..	Spare Cockerels	..	5
12..	"	..	5
13..	"	..	5
14..	"	..	5
15..	Brown Leghorn hens (Wyandotte male for crossing)	4	1
16..	Silver Spangled Hamburgh pullets	4	1
17..	Black Hamburgh hens	4	1
18..	Faverolle hens	5	1
19..	Light Brahma hens	4	1
20..	Silver Laced Wyandotte pullets	4	1
21..	White Leghorn (Hodson) pullets	5	1
22..	Rhode Island Red hens	7	1
23..	Barred P. Rock pullets	7	
24..	Silver Grey Dorking pullets	7	1
25..	Rhode Island Red pullets	7	1
26..	White Wyandotte pullets	7	1
27..	Jubilee Orpington pullets	7	1
28..	Buff " "	9	1
29..	Mixed hens	9	
30..	" pullets	9	
31..	Brown Leg—B. P. Rock cross pullets	9	
32..	Mixed pullets	9	
33..	Mixed (late hatched) pullets	8	

EXPERIMENTS IN CHICKEN FATTENING.

BY FRANK T. SHUTT, M.A., F.I.C.,

Chemist, Dominion Experimental Farms.

In connection with a series of feeding experiments, made with a view of ascertaining the relative digestibility of certain foods by poultry, we were able during the season of 1902 to obtain data of economic value to those preparing chickens for the market. These results were set forth in the report for that year. In continuing the above mentioned research during the past season, we again accumulated results of practical interest to the chicken fattener. These may now be presented, as follows:—

PEN *VS.* CRATE.

Experiments to ascertain the relative merits of pen and crate fattening were made in 1902, and the results, together with the description of the crates and pens, with yards attached, will be found on pages 226-7 of the report of the farms for that year. The tests were made with Barred Plymouth Rock and Silver-grey Dorking, and both breeds, from the standpoint of economy in feeding gave marked results in favour of pen fattening.

The interest evinced in the results and the criticisms they received led us this season to further investigate this subject, and we can accordingly present additional data towards the solution of this problem that will be of interest to poultry fatteners. In one particular a change was made from the plan adopted in 1902; the crated birds were fed in the basement of the laboratory building, a room sufficiently lighted and ventilated, but in temperature 10°F. to 15°F. lower than the accommodation used in 1902. When we remember that the results of last season showed that the weekly gains were invariably reduced during spells of abnormally high summer temperatures, the significance of this modification will be apparent.

No. 1 (pen) and No. 2 (crate).—The feeding was commenced on August 13, 1903, the birds being between seven and eight weeks old, and the test continued for four weeks. Each lot consisted of six birds, as follows:—2 Orpingtons, 2 Barred Plymouth Rocks and 2 crosses, Brown Leghorn and Barred Plymouth Rocks.

The Ration.—For the first two weeks the following was used :

(a) Ground oats.	3 parts.	Protein ratio—1:3·2
Ground barley.	1 part.	Cost, 1·54 cents per lb.
Meat meal.	1 part.	

Mixed with a sufficiency of skim-milk.

During the last two weeks the ration was :

(b) Ground oats.	4 parts	Protein ratio—1:4.
Ground barley.	3 parts	Cost, 1·45 cents per lb.
Meat meal.	1 part.	

Mixed with a sufficiency of skim-milk.

TABLE I.—PEN *versus* CRATE.

Pen or Crate.	Number of Chicken.	Breed.	Pullet or Cockerel.	Weight.										Gain during Experiment.		Average gain per Chicken per Week.
				Beginning of Experiment.		1st Week.		2nd Week.		3rd Week.		4th Week.				
No. 1.				Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Oz.
Pen........ ...	36	Orpington	P	3	9	3	14	4	3½	4	6	4	9	1	0	4·0
"	79	"	C	3	15½	4	10	5	5	5	12	6	4	2	4½	9·3
"	62	B. L. & P. R....	C	2	14½	3	7	3	9	3	15	4	5	1	6½	5·6
"	6	" ...	C	3	11½	4	5½	5	0½	5	2	5	7	1	11½	6·7
"	72	Ply. Rock......	C	2	15½	3	4	3	9	3	14	4	4½	1	5	5·0
"	34	"	C	2	7½	3	1½	3	9	3	13½	4	4	1	12½	7·1
No. 2.																
Crate..........	37	Orpington	C	3	4½	4	0	4	11½	5	3	5	9½	2	5	9·2
"	70	"	C	4	8	5	4½	5	11½	6	4	6	1½	1	9½	
"	76	B. L. & P. R....	C	3	9½	3	13½	4	4½	4	7	5	0	1	6½	5·6
"	65	" ...	C	3	8	4	4	4	13½	5	7	5	12	2	4	9·0
"	71	Ply. Rock... ..	C	3	0½	3	3½	3	8½	3	12	4	2	1	1½	4·3
"	75	"	C	2	11½	2	13½	3	2½	3	5	3	11	0	15½	3·8
No. 3.																
Pen..........	52	Ply. Rock......	C	3	8½	....		5	0	....		6	0½	2	8	10·0
"	49	"	C	3	11	....		5	6½	....		6	6	2	11	10·7
"	41	"	C	2	9½	....		4	1	....		4	11	2	1½	8·4
"	50	"	C	3	4	....		4	6	....		5	0	1	12	7·0
"	35	"	C	3	13½	....		5	7	....		6	6	2	8½	10·1
"	89	"	C	3	10½	....		5	2	....		5	13	2	2½	8·6
No. 4.																
Crate..........	33	Ply. Rock......	C	3	13	....		5	7	....		6	0	2	3	8·7
"	47	"	C	3	15	....		5	9	....		6	5½	2	6½	9·6
"	43	"	C	3	4½	....		4	7½	....		5	3½	1	15	7·7
"	46	"	C	3	5½	....		4	14½	....		5	8½	2	3	8·7
"	66	"	C	3	7	....		4	11½	....		5	7	2	0	8·0
"	38	"	C	3	4	....		4	8	....		5	6½	2	2½	8·6

From the details given in Table I. it will be seen that the increase in weight varied greatly among the members of each group, though the total increase in weight (see Table II.) made during the fattening period was practically the same for each set. Since the birds in the pen ate more food by 2 lbs. 5 ozs., it follows that the cost per pound of increase exceeded that of the crated birds. A further fact in favour of the crate-fed chickens was that they furnished a somewhat larger percentage (2·3 per cent) of dressed carcase (Table III.)

No. 3 (pen) and No. 4 (crate).—Though not in all particulars exactly a duplicate of the foregoing test, its general conduct and the object with which it was made were the same. The chickens employed were all Barred Plymouth Rocks, of one strain and age and very uniform as to weight and build. It was very largely due to this uniformity and the general excellence of type for feeding, we believe, that led to the more satisfactory results than were obtained in the first experiment. The gains throughout were larger, more uniform and were made more economically. Type or build is a matter that has been emphasized repeatedly by the poultry manager as one of considerable importance in the fattening of chickens for the market, and the results of this test, including the general appearance of the dressed birds, certainly support his contention.

TABLE II.—PEN *versus* CRATE.

—	Number of Chickens.		Weight at beginning of experiment.		Weight at close of experiment.		Total increase in weight.		Average increase in weight per chicken.		Food Consumed.				Total cost of food.	Cost of food per lb. increase in live weight.
	Pullets.	Cockerels.									Meal.		Skim-milk.			
			Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Cts.	Cts.
Nos. 1 & 2.																
Pen	1	5	19	9½	29	1½	9	8	1	9⅓	36	0½	66	0	63·7	6·7
Crate	... ...	6	20	10	30	4	9	10	1	9⅔	33	11½	66	0	60.0	6·2
Nos. 3 & 4.																
Pen	.....	6	20	9	34	4½	13	11½	2	4½	47	0	60	0	71·1	5·3
Crate	.....	6	21	1	33	15	12	14	2	2⅓	41	0	60	0	68·4	5·6

TABLE III.—Proportion of Edible and Non-edible parts, calculated on weight of chickens as killed.

—	Edible.		Non-Edible.		
	Dressed carcase.	Giblets.	Head and feet.	Feathers.	Entrails, contents of gizzard, &c.
Nos. 1 & 2.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Pen	66·8	5·3	10·7	9·4	7·8
Crate	69·1	4·7	11·8	8·6	5·7
Nos. 3 & 4.					
Pen	68·0	5·3	10·8	8·9	6·9
Crate	69·2	4·9	10·5	9·8	5·6

Nos. 3 and 4.—The ration used throughout these tests was that employed during the second two weeks of the previous experiment (b), a ration that proved highly satisfactory in the feeding experiments of 1902.

Comparing the results of the pen with those of the crate fed birds, we find that the average increase in live weight per chicken during the feeding trial was somewhat greater for the pen fed birds. These chickens, however, to make this gain consumed more food (see table II.), and a simple calculation shows that, as in the former experiment, the crate-fed birds put on flesh somewhat more cheaply ($\frac{3}{10}$ cent per lb.) than those in the pen. It is worthy of note that both 'pen' and 'crate' birds were fattened at less cost than in the first test (Nos. 1 and 2), there being a difference practically of 1 cent per pound in favour of Nos. 3 and 4. This we believe, in large part, as being consequent upon the better fattening type of the latter.

The proportion of dressed carcase was slightly larger in the case of the crate fed birds, though the difference in this respect was not so marked as with tests Nos. 1 and 2. It was noticed that the dressed birds from the pen were slightly yellower than those from the crate.

These results seem to contradict the conclusions reached in 1902. It is possible that the more favourable temperature for the crated birds this season was the predominating factor in altering the relative economy of the two systems of feeding.

The question of temperature appears to be one well worthy of further investigation. There are also other points upon which we need more information. Until a bird has attained its size, that is, as long as growth in frame continues, it seems to the writer that a certain limited amount of exercise is desirable, if not necessary, for the best results. This stage having been reached—and it will vary somewhat in the age of the chicken with different breeds—it may be found that exercise is no longer necessary and that the additional flesh to round out the bird can be more economically put on in the crate.

'All Grain' *versus* 'Grain and Meat.'

This experiment was undertaken to ascertain the value of adding a certain proportion of meat meal to the fattening ration.

Each lot consisted of 5 Barred Plymouth Rocks, the birds at the beginning of the test being about 3 months old and very uniform as to weight and build. The feeding was done in the pens with yards attached, and continued for four weeks.

The ration of those fed 'all grain' (No. 5) was as follows:—

Ground oats—4 parts. } Protein ratio, 1:6.
Ground barley—3 parts. } Cost, 1·3 cents per lb.
With a sufficiency of skim-milk.

The ration of those fed 'grain and meat' (No. 6) was:—

Ground oats—4 parts.
Ground barley—3 parts.
Meat meal—1 part.
} Protein ratio 1:4. Cost, 1·45 cents per lb.

Table IV.—'All Grain' *versus* 'Grain and Meat.'

Pen No. 5.—'All Grain' Ration.

No. of Chicken.	Breed.	Sex.	Weight.										Gain in four Weeks.	
			Aug. 27.		Sept. 3.		Sept. 10.		Sept. 17.		Sept. 24.			
			Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
8	Barred Plymouth Rock........	C.	2	11½	3	2	3	9	3	14	4	1½	1	6
4	" "	"	3	8½	4	4	4	12	5	5	5	10½	2	2
10	" "	"	3	4½	3	14	4	2	4	11	5	0	1	11½
14	" "	"	3	5	3	15½	4	7	4	15½	5	6½	2	1½
11	" "	"	3	1½	3	11½	4	3½	4	10	5	0	1	14½

Pen No. 6.—'Grain and Meat' Ration.

No. of Chicken.	Breed.	Sex.	Aug. 27. Lbs.	Oz.	Sept. 3. Lbs.	Oz.	Sept. 10. Lbs.	Oz.	Sept. 17. Lbs.	Oz.	Sept. 24. Lbs.	Oz.	Gain Lbs.	Oz.
16	Barred Plymouth Rock........	C.	2	15½	3	6	4	0	4	6	4	14½	1	15
17	" "	"	3	0	3	8	4	2	4	9½	5	1½	2	1½
15	" "	"	2	15½	3	10½	4	3½	4	11	5	3½	2	4
24	" "	"	3	2	3	10½	4	3½	4	8½	5	0	1	14
18	" "	"	3	2½	3	15	4	5	4	12½	5	3	2	0½

TABLE V.—'ALL GRAIN' *versus* 'GRAIN AND MEAT.'

Ration.	No. of Chickens.	Weight at beginning of experiment.		Weight at close of experiment.		Total increase in weight.		Average incre'se in weight per Chicken.		Food Consumed. Meal.		Food Consumed. Skim-milk.		Total cost of food.	Cost of food per lb. of increase in live weight.
		Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Cents.	Cents.
All grain..................	5	15	15	25	2½	9	3½	1	13½	33	1	46	0	49·8	5·4
Grain and meat......... .	5	15	3½	25	6½	10	3	2	0⅗	34	13	46	0	57·2	5·6

TABLE VI.—PROPORTION of Edible and Non-edible parts, calculated on weight of Chicken as killed.

Ration.	Edible. Dressed carcase.	Edible. Giblets.	Non-Edible. Head and feet.	Non-Edible. Feathers.	Non-Edible. Entrails, contents of gizzard, &c.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
All grain....	67·7	5·3	11·5	9·6	5·7
Grain and meat............	67·8	5·3	11·1	9·4	6·3

At the outset, the 5 chickens put on the 'grain and meat' ration weighed in all 11½ ounces less than those to be fed 'all grain'; at the close of the experiment their weight exceeded that of the grain fed chickens by 4 ounces. In other words, the 'grain and meat' birds gained 15½ ounces (or a little more than 3 ounces per chicken) more than the 'all grain' fed chickens, and this gain resulted from the consumption of 1 lb. 12 oz. more food.

Leaving out of consideration for the moment their relative cost, it will be interesting to ascertain the relative value of these two rations in flesh production. Since the amount of skim-milk consumed was the same for each set, we may neglect its consideration in the calculation. In the case of the 'all grain' test, the birds ate 33 lbs. 1 oz. and gained 9 lbs. 2½ oz., or for 1 lb. of increase in live weight 3·586 lbs. of the ration were consumed. With the 'grain and meat' ration, 34 lbs. 13 oz. were eaten, with a concomitant gain of 10 lbs. 3 oz. in live weight, or for 1 lb. of increase, 3·417 lbs. of meal were consumed.

These results show an increased efficiency for the ration containing the meat scrap. When, however, the relative cost of the ration is taken into account, the 'all grain' has slightly the advantage (by reason of it costing less), the difference being two-tenths of a cent per lb. of increase more in the case of the 'grain and meat' ration.

On killing and dressing, the two lots were found to be remarkably similar as regards plumpness and weight, due largely, the writer thinks, to the uniformity of type already referred to. They furnished identical data as regards the percentage of dressed carcase (table VI), and were only distinguished into groups by the slightly yellow tinge of the 'all grain' fed birds; the chickens from the 'grain and meat' ration gave a perfectly white flesh.

SATURATED LIME-WATER FOR THE PRESERVATION OF EGGS.

By Frank T. Shutt, M.A.

Chemist, Dominion Experimental Farms.

The solubility of lime in water at ordinary temperatures is one part in 700 parts of water. Such a solution would be termed saturated lime water. Translated into lbs. and gallons, this means that one lb. of lime is sufficient to saturate 70 gallons of water. However, owing to impurities in commercial lime, it is well to use more than is called for in this statement. It may not, however, be necessary, if good, freshly burnt quick lime can be obtained, to employ as much as was at first recommended, namely, 2 to 3 lbs. to 5 gallons of water. With such lime as is here referred to, one could rest assured that 1 lb. to 5 gallons (50 lbs.) would be ample, and that the resulting lime-water would be thoroughly saturated. The method of preparation is simply to slake the lime with a small quantity of water, and then stir the milk of lime so formed into the 5 gallons of water. After the mixture has been kept well stirred for a few hours, it is allowed to settle. The supernatant liquid, which is now 'saturated' lime-water, is drawn off and poured over the eggs, previously placed in a crock or water-tight barrel.

As exposure to the air tends to precipitate the lime (as carbonate), and thus weaken the solution, the vessel containing the eggs should be kept covered. The air may be excluded by a covering of sweet oil, or by sacking upon which a paste of lime is spread. If after a time there is any noticeable precipitation of the lime, the lime-water should be drawn off or siphoned off and replaced with a further quantity newly prepared.

It is essential that attention be paid to the following points:—

1. That perfectly fresh eggs only be used.

2. That the eggs should throughout the whole period of preservation be completely immersed.

Although not necessary to the preservation of the eggs in a sound condition, a temperature of 40°F. to 45°F. will no doubt materially assist towards retaining good flavour, or rather in arresting that 'stale' flavour so characteristic of packed eggs.

Respecting the addition of salt, it must be stated that our experiments, conducted now throughout three seasons, do not show any benefit to be derived therefrom; indeed, salt appears to impart a limey flavour to the egg, probably by inducing an interchange of the fluids within and without the eggs.

Water glass (sodium silicate), has been extensively experimented with, using solutions varying from 2 per cent to 10 per cent. Although in the main the results have been fairly satisfactory, we are of the opinion that lime-water is fully its equal, if not its superior, as a preservative, and that this latter preservative is both cheaper and pleasanter to use there can be no doubt.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

REPORT OF R. ROBERTSON, SUPERINTENDENT.

NAPPAN, N.S., November 30, 1903.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my annual report of operations on the experimental farm for the maritime provinces at Nappan, N.S.

The season has not been quite as favourable for farm crops as that of 1902. The early part was particularly dry, and crops generally made a poor start, from which they never completely recovered. Hay was quite below the average and the new take of clover is the poorest we have had for years. Owing to favourable weather after about June 25th roots were a fairly good crop, while corn was poor. Pasture was poor the whole season.

I wish to again acknowledge my indebtedness for valuable assistance rendered by Mr. J. Thomas Coates, farm foreman, who has kept all records of crop experiments, and to Mr. R. Donaldson, herdsman, who has kept all records of live stock experiments, each doing so in a careful and painstaking manner.

WEATHER.

December opened with no frost in the ground, but on the 2nd it was well frozen up. A light snow on the 4th was followed by a heavy fall on the 5th, accompanied by high winds, which made it drift badly. The temperature fell to zero on the 7th, and on the 9th 10° below zero, with 16° below on the 10th. The temperature continued below zero to the 16th, with one day only above that point. On the 8th, 6 inches of snow fell. This drifted badly on the 9th, 10th and 11th, when one of the coldest winds and snowstorms experienced in many years blocked the roads so that it was necessary to break them out. The 17th was moderate, with rain, and the snow all went off. This was followed by cold and rain again on the 22nd. Slight snow fell occasionally from the 22nd to the 29th, but not enough to make sleighing. It snowed sufficient for sleighing on the 29th, but it went off again the following day.

January commenced fine, with no very cold weather until the 8th. Snow fell to make good sleighing on the 7th, which continued good for the month. The temperature went below zero on the 10th, 11th, 14th, 19th, 20th, 24th, 25th, 26th and 27th, registering 2°, 4°, 2°, 12°, 9°, 4°, 4°, 2°, 4° on these dates respectively.

February opened cold and fine, with occasional snow and rain to the 17th, when we had a snow storm, followed by cold weather to the 23rd. Another snow and wind storm prevailed on the 23rd and 28th. The temperature went below zero only three times during this month, on the 8th, 18th and 20th, when 2°, 5°, 5°, respectively was registered.

March opened fine but mild, taking off the snow. It snowed on the 6th, but moderated again, and it all went off on the 7th. The weather was fine and mild to the 17th, and it continued more or less broken to the end of the month. Very little snow fell during the month.

April came in cold, but broken weather set in and continued more or less wet until the 20th. Some snow fell on the 16th, 17th, 18th and 20th. The rainfall during the month was 3·57 inches. The first seeding was done April 27th.

May commenced cool but fine. The month throughout was warmer than usual. Frost was recorded seven times during the month, on the 2nd, 3rd, 10th, 13th, 16th, 25th and 26th, there being 3°, 7°, 2°, 1°, 10°, 8° and 4°, respectively on these dates. There was little rainfall during the month, only ·68 inches.

June was unusually fine and dry, continuing with one exception to the 25th. Crops and pastures suffered greatly for want of rain during this period, and many of the June sown roots and vegetable seed failed to germinate quickly on account of a lack of moisture. A slight rainfall on the 14th and 15th, but only ·20 inch, not doing much good. On the 25th and 26th, however, a fall of 1·69 inches thoroughly wet the ground, doing a vast amount of good, and considerable seed that had been in the ground some weeks, and remained dormant, on account of a lack of moisture germinated. From this date forward all roots and grain crops did exceptionally well. From this to the end of the month there were four light rains. The total rainfall for the month was 2·29 inches. The only frosts recorded in the month was on 1st, 2nd, 4th and 5th, when 4°, 3°, 4° and 3° was registered, respectively, at these dates. The month throughout was not as warm as usual, and as a result the corn crop made a poor start.

July was more or less broken, but with no very heavy rains. The rainfall for the month was 2·07 inches. The month generally was not as warm as usual. On the 9th 80° was registered, and on the 11th, 82°, these being the two warmest days.

August was fine to the 7th, when rain fell, followed by another rainfall on the 10th. From the 10th to the 18th was fine, when rain again occurred. The remainder of August was practically free from rain, with the exception of the last day. The rainfall during the month was 2·40 inches. This month throughout was cooler than generally experienced here, and at no time during the month did the temperature go above 76°, that point being reached only once, August 20th. On the 23rd, very high tides, accompanied with high winds, did considerable damage to marsh lands by breaking and flowing over the dykes.

September was showery to the 9th. From the 9th to the 17th was fine, with two days wet weather, on the 17th and 18th, and fine again to the 28th, with showery weather to the end of the month. The total rainfall for the month was 3·63 inches. The month averaged about up to the usual temperature. The thermometer only once went above 76°, and that was on the 14th, when 80° was recorded.

October commenced with fine weather, but we had a heavy rain on the 10th and 11th, of 2·85 inches. This was followed by changeable weather to the 18th, when 2·15 inches of rain fell, accompanied by high winds, which shook many apples off the trees. The remainder of the month was more or less changeable. The rainfall for the month was 5·78 inches. The first frost of the season was October 4th, when 6° of frost was registered. There was little frost during the month.

November up to the 20th was very mild, with very little frost. The month, however, was unusually wet up to that time. On the 17th, 18th and 19th 3·15 inches of rain fell. The total rainfall for the month was 7·98 inches. This made it difficult to harvest root crops on the wet land and made fall ploughing backward. From the 20th to the end of the month was more or less frozen and little ploughing was done after that date.

EXPERIMENTS WITH OATS.

In this uniform test of varieties forty-five different sorts were grown in plots of one-fortieth acre each. These plots all received the same treatment and were on soil practically uniform throughout.

The soil was a clay loam. The previous crop was mangels, for which crop twenty one-horse cart loads of manure were applied. The ground was ploughed in the fall,

and in the spring it was harrowed twice with the spring tooth and once with the smoothing harrows. The seed was sown May 4, at the rate of 2½ bushels per acre, with the seed drill. The seed for these plots was from heads selected in the field, at harvest time, before cutting the various plots the previous season. The ground was seeded down with 3 pounds alsike clover, 7 pounds Mammoth Red clover and 12 pounds Timothy seed per acre, by means of a grass seeder attached to the seeder.

No fertilizer was used this season, the grain started slowly and irregularly, made fair growth, did not rust and the seed filled out well. Some smut was noticed in many of the plots; some of the straw lodged, but generally speaking was strong and stood up well.

Oats.—Test of Varieties.

Number.	Name of Variety.	Date of Ripening		Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
					Inch's		Inches.		Lbs.	Bush.	Lbs.	Lbs
1	Sensation	Aug.	26.	114	42—46	Stiff	6—8	Branching	7,040	98	28	37
2	Twentieth Century	"	24.	112	42—46	"	6—8	"	6,600	97	22	38
3	Thousand Dollar	"	26.	114	45—48	"	6—8	"	7,080	97	22	37½
4	Waverley	"	31.	119	45—50	"	6—9	"	5,440	97	22	37
5	Siberian	"	26.	114	45—49	"	6—9	"	6,960	96	16	35
6	Banner	"	25.	113	43—48	"	6—8	"	6,520	95	10	38
7	Joanette	"	22.	110	36—40	Medium	6—9	"	5,800	94	4	36
8	White Giant	"	31.	119	44—48	Stiff	6—9	"	6,600	94	4	37½
9	Abundance	"	25.	113	43—47	"	6—8	"	6,400	92	32	36
10	Goldfinder	"	31.	119	47—52	"	6—9	"	5,800	92	32	35
11	Danish Island	"	27.	115	43—47	"	5—8	"	6,680	90	20	37½
12	Improved Ligowo	"	26.	114	43—48	"	6—8	"	6,400	89	14	37
13	Lincoln	"	25.	113	43—46	"	5—7	"	6,840	89	14	37½
14	Wide Awake	"	26.	114	43—48	"	5—8	"	6,800	88	8	38
15	White Schonen	"	26.	114	42—46	"	5—8	"	6,520	88	8	37½
16	Olive Black	"	28.	116	46—52	"	6—9	Sided	6,600	88	8	37
17	Swedish Select	"	27.	115	41—46	"	5—7	Branching	5,600	87	2	36
18	Pioneer	"	20.	108	40—44	"	6—9	"	5,480	85	30	39
19	Salines	Sept.	2.	121	44—50	"	6—9	"	6,600	85	30	36
20	Black Beauty	Aug.	20.	108	44—48	"	7—9	"	5,000	84	24	35
21	Early Golden Prolific	"	28.	116	46—50	"	6—8	"	6,600	84	24	35½
22	Improved American	"	26.	114	42—46	"	6—8	"	5,720	84	24	35
23	Wallis	"	26.	114	38—42	"	5—8	"	5,400	83	18	37
24	Mennonite	"	25.	113	42—46	"	6—8	"	6,560	82	12	37½
25	Golden Fleece	"	27.	115	40—46	"	6—8	"	5,800	82	12	35
26	Holstein Prolific	"	25.	113	44—47	"	5—7	"	4,960	82	12	36½
27	Bavarian	"	26.	114	42—46	"	5—7	"	6,520	81	6	37
28	Pense Black	"	28.	116	43—52	"	6—9	Sided	6,000	81	6	38
29	Milford Black	"	26.	114	41—45	"	6—8	"	5,600	80	0	39
30	Golden Tartarian	Sept.	2.	121	42—46	"	6—9	"	5,480	77	22	35
31	Kendal Black	Aug.	26.	114	40—45	"	6—8	"	5,400	75	10	39
32	Kendal White	"	26.	114	40—45	"	6—8	"	6,400	75	10	39
33	Milford White	"	26.	114	40—45	"	6—8	"	6,280	74	4	38½
34	Olive White	"	28.	116	46—52	"	6—9	"	5,400	71	26	38
35	American Beauty	"	25.	113	40—45	"	5—7	Branching	4,720	71	26	37
36	Tartar King	"	21.	109	44—49	"	6—8	Sided	4,800	70	20	37
37	New Zealand	Sept.	1.	120	42—46	"	6—8	"	5,200	70	20	35
38	Pense White	Aug.	28.	116	44—52	"	6—9	"	5,600	69	14	39
39	Scotch Potato	"	27.	115	40—44	"	6—8	Branching	5,880	68	8	38
40	Golden Beauty	"	26.	114	38—43	"	5—7	"	4,400	64	24	36
41	Buckbee's Illinois	"	29.	117	40—45	"	5—7	"	5,000	62	12	35
42	Columbus	"	27.	115	38—45	"	5—7	"	3,600	62	12	33
43	Golden Giant	"	31.	119	44—47	"	6—9	Sided	3,800	60	0	35
44	American Triumph	"	29.	117	42—46	"	6—9	Branching	3,880	58	28	34
45	Irish Victor	"	26.	114	36—40	"	6—8	"	3,840	58	28	36

OATS—NOT INCLUDED IN THE UNIFORM TRIAL PLOTS.

These were all sown on May 4 in plots of one-fortieth acre each adjoining the Uniform Trial Plots.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw	Yield per Acre.		Weight per Bushel.
					Inches.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Abysinnia	May 4	Aug. 24	112	42—46	Stiff	6—8	Branching	6,000	88	8	37½
2	Rosedale	" 4	" 24	112	40—45	"	6—9	Sided	6,600	87	2	40
3	Early Blossom	" 4	" 24	112	40—46	"	6—8	"	6,600	85	30	40
4	Cream Egyptian	" 4	" 25	113	42—47	"	5—7	Branching	6,400	84	24	39
5	Salzer's Big 4	" 4	" 22	110	44—48	"	6—9	Sided	5,880	84	24	37
6	White Russian	" 4	" 25	113	42—45	"	6—8	Branching	5,600	74	4	37½
7	Cromwell	" 4	" 29	117	44—48	"	5—7	"	4,800	72	32	34
8	Black Mesdag	" 4	" 17	105	44—48	"	7—9	"	5,080	69	14	35
9	Oderbruch	" 4	" 26	114	42—46	"	6—8	Sided	4,680	68	8	37
10	Newmarket	" 4	" 26	114	42—45	Medium	6—8	Branching	4,200	67	2	37
11	Pense	" 4	" 26	114	40—44	Stiff	6—8	Sided	5,200	64	24	38
12	P.E.I. Black	" 4	" 24	112	38—42	Medium	6—8	Branching	5,400	58	28	36

EXPERIMENTS WITH BARLEY.

These comparative tests were conducted on land similar to that used for the oat plots, which was practically of a uniform character. The soil was a clay loam, having been in mangels last year, and manured for that crop with twenty one-horse cart loads of stable manure per acre. After the mangel crop was removed the land was ploughed, and this spring it was worked twice with the spring tooth and once with the smoothing harrow. No fertilizer was used for the crop this season.

Twenty varieties of six-rowed and fifteen of two-rowed sorts were sown, all on May 13, in one-fortieth acre plots, at the rate of 2 bushels per acre. The seed for these plots was from heads selected in the field, at harvest time, before cutting the various plots, the previous season. Timothy and clover seed was sown at the same time at the rate of 3 pounds Alsike, 7 pounds Mammoth Red clover and 12 pounds of Timothy seed per acre. The plants started slowly and irregular, but good growth was made later in the season. There was no rust and the grain filled out well. Some smut was noticed in some of the plots. The information given in the following table was obtained from the experiments:—

BARLEY, SIX-ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Oderbruch	Aug. 19	98	42—46	Stiff	2—2½	6,400	66	32	48½
2	Empire	" 21	100	40—44	"	2—3	6,520	65	40	48½
3	Trooper	" 20	99	42—46	"	2—3	6,400	65	..	48¼
4	Nugent	" 25	104	38—43	"	2—2½	6,440	64	8	48
5	Common six-rowed	" 20	99	40—45	"	2—2½	6,280	63	16	48
6	Odessa	" 18	97	42—45	"	2—3	6,200	60	40	48
7	Mensury	" 22	101	40—45	"	2—3	6,800	60	..	48
8	Albert	" 20	99	41—44	Medium	2—2½	6,120	59	8	48½
9	Baxter	" 20	99	40—44	Stiff	2—3	6,000	59	8	48
10	Stella	" 25	104	38—42	"	2—3	5,880	58	16	48
11	Royal	" 20	99	37—41	Medium	2—2½	6,200	58	16	47½
12	Mansfield	" 22	101	41—46	Stiff	2—3	6,240	55	40	47½
13	Summit	" 25	104	38—42	"	2—3	6,120	54	8	48
14	Argyle	" 21	100	40—43	"	2—3	6,040	54	8	47
15	Brome	" 24	103	40—44	"	2—3	5,400	53	16	48
16	Yale	" 25	104	38—42	Medium	2—2½	5,880	53	16	48
17	Garfield	" 21	100	40—43	"	2—2½	5,400	50	..	48½
18	Champion	" 17	96	43—48	Stiff	2½—3	5,880	49	8	39
19	Claude	" 20	99	39—42	Medium	2—2½	5,520	48	16	47½
20	Rennie's Improved	" 20	99	40—43	"	2—2½	5,800	45	40	48½

BARLEY TWO-ROWED—TEST OF VARIETIES.

1	Danish Chevalier	Aug. 22	101	36—42	Stiff	3—4	5,400	65	0	51
2	Newton	" 22	101	41—45	"	2½—3	4,800	64	8	50
3	Beaver	" 21	100	35—37	Medium	2½—3½	4,200	60	40	50
4	Canadian Thorpe	" 22	101	36—42	Stiff	2—3	4,400	59	8	49
5	French Chevalier	" 22	101	38—43	"	3—4	4,600	58	16	50
6	Invincible	" 24	103	38—42	"	2—3	4,480	55	40	50½
7	Standwell	" 24	103	38—42	"	2—3	4,400	52	24	50
8	Durham	" 22	101	40—46	"	2½—3½	4,400	49	8	48
9	Fulton	" 24	103	39—43	"	2—3	4,600	48	16	48
10	Gordon	" 22	101	40—46	"	2—3	3,720	46	32	48
11	Logan	" 22	101	40—46	"	2½—3½	4,880	45	40	48
12	Sidney	" 22	101	38—42	Medium	2½—3¼	4,720	43	16	48
13	Clifford	" 21	100	40—44	Strong	2½—3½	3,600	42	24	49
14	Harvey	" 22	101	40—46	"	2½—3½	3,800	40	40	51
15	Jarvis	" 22	101	39—43	Medium	3—4	3,600	40	0	48

EXPERIMENTS WITH SPRING WHEAT.

The ground selected for these plots was a light clay loam which was in corn the previous year. The land was manured for the corn crop, with twenty one-horse cart loads of stable manure per acre. The land was ploughed after the corn crop was removed, and this spring was worked by twice harrowing with the spring tooth and once with the smoothing harrow. The seed was sown with the seed drill April 29, at the rate of 1¾ bushels per acre. The seed for these plots was from heads selected in the field at harvest time, before cutting the various plots, the previous season. The land was seeded down at the same time, with a mixture of 3 pounds Alsike clover, 7 pounds Mammoth Red clover and 12 pounds of Timothy seed per acre.

Sixty-one varieties were sown in one-fortieth acre plots, all of which received the same treatment. The seed germinated very slowly, during which time the weeds got a better start than usual. The grain made a fair growth. The straw was rather light,

and the grain did not fill out as well as it usually does. There was no rust, but a few heads of smut were occasionally noticed. The yield from these plots is given in the following table:—

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Byron	Aug. 26	119	38—42	Medium	2 —3	Bearded	3880	42	40	60½
2	Early Riga	″ 22	115	42—47	Stiff	2 —3	Beardless	4200	42	0	61
3	Chester	″ 27	120	40—45	″	2 —3¼	″	3600	40	0	61
4	Wellman's Fife	″ 31	124	44—48	″	2½—3½	″	5000	38	0	61
5	Essex	″ 29	122	44—48	″	2½—3½	″	4400	38	0	59
6	Minnesota No. 149	″ 31	124	40—43	″	2 —3	″	4320	37	20	61
7	Crawford	″ 29	122	40—44	″	2 —3	″	4680	36	40	61
8	Red Fife	″ 28	121	40—44	″	2 —3¼	″	5200	36	40	60
9	Rio Grande	″ 27	120	42—46	″	2½—3½	Bearded	4800	36	40	61
10	Admiral	″ 29	122	43—48	″	2½—3	″	4680	36	0	60
11	White Fife	″ 31	124	43—48	″	2½—3½	Beardless	4800	36	0	61
12	Laurel	″ 31	124	41—45	″	2½—4	″	4400	36	0	61
13	White Connell	″ 31	124	38—45	″	2 —3	″	4600	35	20	61
14	Monarch	″ 29	122	42—46	″	2 —3	″	4280	35	20	60½
15	Red Swedish	″ 29	122	43—46	″	2½—3¼	Bearded	4640	35	20	59½
16	Norval	″ 27	120	40—44	Medium	2 —3	″	3800	34	40	60¼
17	Dawn	″ 27	120	42—46	″	2 —3	Beardless	4600	34	0	60
18	Clyde	″ 29	122	40—44	Stiff	2 —3	″	4200	34	0	60½
19	Australian, No. 23	″ 31	124	40—45	″	2 —3	″	4400	33	20	60
20	Advance	″ 25	118	43—47	″	2½—3¼	Bearded	4800	32	40	60
21	Minnesota No. 181	″ 31	124	44—48	″	2½—3½	Beardless	4720	32	0	60
22	Australian, No. 13	″ 31	124	38—42	″	2 —3	″	3800	32	0	60
23	Bishop	″ 27	120	40—46	″	2 —3	″	4200	31	20	60
24	Crown	″ 27	120	41—46	Medium	2 —3	Bearded	4400	31	20	60
25	Herrison Bearded	″ 27	120	38—40	″	1 —1½	″	3880	31	20	60
26	White Russian	″ 29	122	40—46	Stiff	2 —3¼	Beardless	4120	30	40	60
27	Japanese	″ 29	122	40—45	″	2 —3	Bearded	4920	30	40	60
28	Pringle's Champlain	″ 28	121	41—46	″	2 —3	″	3720	30	0	60
29	Vernon	″ 28	121	43—46	″	2 —3	″	3760	30	0	60
30	Alpha	″ 27	120	40—46	″	2 —3	″	4400	30	0	60
31	Australian No. 9	″ 31	124	40—43	″	2 —3	Beardless	3800	29	20	61
32	Robin's Rust Proof	″ 31	124	38—45	Medium	2 —3	″	3320	28	40	61
33	Stanley	″ 28	121	40—45	″	2 —3	″	4600	28	40	60
34	Minnesota, No. 163	″ 31	124	40—45	Stiff	2½—3	″	4400	28	40	60
35	Preston	″ 28	121	42—46	″	2 —3	Bearded	4400	28	0	60
36	Australian, No. 10	″ 31	124	38—43	″	2 —3	Beardless	3600	27	20	59½
37	Huron	″ 28	121	40—43	Medium	2 —3	Bearded	3320	26	40	61
38	Percy	″ 29	122	44—48	Stiff	2 —3	Beardless	4000	26	40	60
39	Minnesota No. 169	″ 31	124	40—45	″	2 —3	″	3400	26	0	60
40	Angus	″ 29	122	38—41	″	2 —3	″	3400	26	0	60
41	Cassel	″ 31	124	40—44	″	2 —3	″	3200	26	0	61
42	Countess	″ 29	122	40—45	″	2 —3	″	3400	25	20	59
43	Progress	″ 28	121	43—48	Stiff	2 —3	″	3640	24	40	59
44	Hungarian	″ 28	121	40—44	Medium	2 —2½	Bearded	3000	24	40	60
45	Colorado	″ 25	118	43—47	Stiff	2½—3	″	4480	24	0	60
46	Weldon	″ 29	122	42—46	″	2½—3¼	Beardless	2720	23	20	60
47	Red Fern	″ 28	121	40—43	″	2 —3	Bearded	4000	22	0	61
48	Goose	″ 27	120	40—43	Medium	1½—2	″	3560	22	0	60
49	Roumanian	″ 29	122	37—42	″	1 —2	″	3240	21	20	60½
50	Benton	″ 29	122	40—44	″	2 —3	Beardless	3160	20	40	60
51	Australian No. 27	″ 31	124	38—42	Stiff	2 —3	″	3200	20	0	59½
52	Blair	″ 29	122	43—47	″	2½—3	″	3720	20	0	59½
53	Fraser	″ 27	120	40—45	″	2 —3	Bearded	3480	19	20	59½
54	Cartier	″ 28	121	35—40	Medium	2 —3	″	3120	18	40	58
55	Australian No. 25	″ 31	124	40—43	Stiff	2 —3	Beardless	3040	18	0	59
56	Australian No. 19	″ 31	124	40—45	″	2 —3	″	2920	17	20	59
57	Hastings	″ 29	122	35—40	Medium	2 —3	″	2540	16	40	58
58	Plumper	″ 29	122	40—43	″	2 —3	Bearded	2440	16	40	59
59	Medeah	″ 29	122	30—35	Weak	1 —2	″	2120	16	0	53
60	Mishriki	″ 29	122	20—25	″	1 —1½	″	2080	16	0	52

EXPERIMENTS WITH EMMERS AND SPELTS.

Experiments have been conducted this season with two varieties of emmer and two of spelt, with the following results. They were all sown on April 29, on land adjoining the wheat plots:—

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Yield per Acre.		Weight per Measured Bushel.
			Bush.	Lbs.	Lbs.
White Spelt	Sept. 8.	132	29	20	35
White Bearded Spelt	" 2	126	28	40	34
Common Emmer (Speltz)	Aug. 29.	122	25	20	
White Emmer	Sept. 2.	126	23	20	

EXPERIMENTS WITH PEASE.

Forty varieties of pease were sown May 9 in one-fortieth acre plots. The land was a light clay loam, similar to that chosen for the wheat plots. This land was previously in corn and was manured for that crop with twenty one-horse cart loads of stable manure per acre. This ground was ploughed after the corn crop was removed, in the fall of 1902, and the following spring was worked up by harrowing twice with the spring tooth and once with the smoothing harrow.

The seed was sown with the seed drill, and Timothy and clover mixed, at the rate of 3 pounds Alsike clover, 7 pounds Mammoth Red clover and 12 pounds Timothy seed per acre was sown at the same time. The crop was light. The plants did not make strong growth, but the quality of the seed was good. The following results were obtained from this experiment:—

PEASE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
					In.	In.		Bush.	Lbs.	Lbs.
1	Arthur	Sept. 9..	123	Fair	34—38	2 —2½	Medium	44	40	62
2	Archer	" 10..	124	"	36—40	2 —2¼	"	42	..	62
3	Crown	" 7..	121	"	30—36	1½—2	Small ..	40	..	62
4	Macoun	" 10..	124	Strong	45—48	2 —3	Large ..	38	40	61
5	Mummy	" 9..	123	Fair	36—40	2 —2½	Medium	37	20	62
6	Daniel O'Rourke	" 8..	122	"	38—42	1½—2	Small ..	36	40	61½
7	Agnes	" 9..	123	"	36—40	2 —2¼	Large ..	35	20	62
8	English Grey	" 14..	128	"	36—40	2 —3	" ..	34	..	60
9	Pride	" 7..	121	Medium..	36—40	2 —2½	Medium	34	..	63
10	Elliot	" 12..	126	"	36—40	2 —3	Large ..	33	20	61
11	Nelson	" 9..	123	"	32—36	2 —2½	Medium	32	40	62½
12	Alma	" 8..	122	Fair	34—40	2 —3	Large ..	31	20	62
13	Mackay	" 12..	126	"	35—40	1½—2	Medium	30	40	61
14	Centennial	" 10..	124	"	36—40	2 —2¼	"	30	40	61
15	Carleton	" 10..	124	"	35—39	2 —3	Large ..	30	..	61
16	Bruce	" 8..	122	"	34—40	2 —3	" ..	30	..	62
17	Large White Marrowfat	" 9..	123	Good	41—46	2 —3	" ..	29	20	62½
18	Perth	" 10..	124	Fair	36—40	2 —2½	Medium	28	40	61½
19	Gregory	" 15..	129	"	36—41	2 —3	Large ..	28	40	61
20	Black Eyed Marrowfat	" 10..	124	"	36—42	2 —3	" ..	28	..	62

PEASE—TEST OF VARIETIES—*Concluded.*

Number.	Name of Variety.	Date of Ripening.	No. of days maturing.	Character of Straw.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per bushel.
					Inches.	Inches.		Bush.	Lbs.	Lbs.
21	Prince Albert	Sept. 7..	121	Medium..	33—38	2 —2¼	Medium	27	20	62
22	Trilby	" 14..	128	" ..	30—35	1½—2	"	26	40	62
23	New Potter	" 12..	126	" ..	35—38	2 —2¼	"	26	..	61
24	Victoria	" 13..	127	" ..	36—40	2 —3	Large..	26	..	60
25	Kent	" 13..	127	" ..	30—36	2 —3	" ..	26	..	61
26	Prussian Blue	" 9..	123	" ..	35—38	2 —2¼	Medium	25	20	60½
27	German White	" 14..	128	" ..	33—38	2 —2½	"	25	20	61
28	Pearl	" 12..	126	" ..	35—40	2 —2¼	"	24	40	60
29	Early Britain	" 8..	122	" ..	30—33	2 —2½	Large..	24	..	60½
30	Wisconsin Blue	" 14..	128	" ..	38—40	2 —2¼	Medium	23	20	60
31	Fergus	" 15..	129	" ..	32—38	2 —2¼	"	21	20	62
32	Duke	" 8..	122	" ..	34—38	2 —2½	Large .	20	40	61
33	Lanark	" 11..	127	Poor.....	30—33	2 —2¼	Medium	20	..	61
34	King	" 10..	124	"	28—32	1½—2	Small..	20	..	60
35	Golden Vine	" 8..	122	"	28—33	1½—2	" ..	18	40	62
36	Prince	" 9..	123	Medium..	32—38	2 —2½	Medium	18	..	61
37	Picton	" 8..	122	" ..	30—35	1½—2	Small..	16	40	62
38	White Wonder	" 8..	122	Poor.....	24—30	2 —2¼	Medium	13	20	61
39	Paragon	" 10..	124	"	30—33	2 —2½	Large..	13	20	61
40	Chancellor*									

*Failed.

EXPERIMENTS WITH BUCKWHEAT.

These experiments were conducted on land similar to and receiving the same treatment as that on which the barley plots were grown. The ground was in mangels the previous year, and received for that crop twenty one-horse cart loads of stable manure per acre. The land was ploughed in the fall of 1902, and this spring was worked up by going over it twice with the spring-tooth and once with the smoothing harrow.

The seed was sown with the seed drill, June 12, in one-fortieth acre plots, and five varieties were included in the test. The land was also seeded down as for the other grain plots, with Timothy and clover. The yield per acre, time of ripening and character of growth are given below:—

BUCKWHEAT—TEST OF VARIETIES.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Yield per Acre.		Weight per Bushel.
				Inches.		Bush.	Lbs.	Lbs.
Silver Hull	June 12..	Sept. 3..	83	38—42	Strong....	45	40	52
Rye Buckwheat	" 12..	" 4..	84	35—42	"	45	0	52
Tartarian or Siberian	" 12..	" 4..	84	34—38	"	43	16	50
Japanese	" 12..	" 3..	83	40—44	"	34	8	45
Grey	12..	" 3..	83	38—42	"	31	32	45

FIELD CROP OF GRAIN.

Six acres of field grain were sown May 16, on a light clay loam. The previous crop was turnips, for which thirty-five one-horse cart loads of stable manure had been used per acre. Previous to this manuring for the root crop this land had never received any manure. The ground was ploughed in the fall, after the root crop was removed, and in the spring was worked up with the spade, spring-tooth and smoothing harrows. The grain was sown with the seed drill and seeded down to Mammoth Red clover, 10 pounds per acre. Five acres were seeded to oats and one with barley. The following table gives the names of varieties grown, amount of land to each variety, yield per acre, by measure from the threshing machine, and the weights per bushel. The mixed grain was oats, 2 bushels; barley, 1 bushel, and pease, 1 peck, mixed together and sown at the rate of 2½ bushels per acre:—

—	Weight per Measured Bushel.	Yield per Acre.	
	Lbs.	Bush.	Lbs.
1¼ acre, Sensation oats	37	70	14
1¼ " Cream Egyptian oats	39	65	0
1¼ " Black Tartarian	36	62	12
1¼ " Canadian Thorpe barley	49	45	0
1¼ " mixed oats, barley and pease	43	62	12

FIELD CROPS OF MIXED GRAIN.

Eleven acres of mixed grain were grown on a clay loam soil. The previous crop was clover and Timothy, which was ploughed in the fall, with the aftermath turned under, which was light. The ground was manured in 1900 for a root crop, followed by grain in 1901, and clover in 1902. The soil was worked up into a good tilth and the grain sown with the seed drill. Six acres was sown May 5, with a mixture of the following proportions: Oats, Rosedale, 2 bushels; barley, Surprise, 1 bushel, and Golden Vine pease, 1 peck, sown at the rate of 2½ bushels per acre. This was harvested August 29. Five acres was sown May 11, with Sensation oats, 2 bushels; Canadian Thorpe barley, 1 bushel; Golden Vine pease, 1 peck, mixed together and sown at the rate of 2½ bushels per acre. This was harvested September 3. The following yields per acre of measured bushels from the threshing machine, weighing 41 pounds per bushel were obtained: 6 acres Rosedale oats, Surprise barley, Golden Vine pease mixed, yielded 65 bushels per acre. 5 acres Sensation oats, Canadian Thorpe barley and Golden Vine pease mixed, yielded 72 bushels per acre.

FIELD CROP OF OATS ON MARSH LAND.

Five acres of oats were sown May 8, on marsh land that had been ploughed the previous fall. This was seeded at the time the grain was sown, with clover and Timothy. This made a fairly good growth the early part of the season, but owing to the exceptionally high tides in August, which broke the dykes and overflowed the land, the grain crop was almost a total loss, and the young take of clover and timothy was completely destroyed.

FIELD CROPS OF BUCKWHEAT.

Four and one-half acres of Silverhull buckwheat was sown on land that had been brought into cultivation for the first time last season. The ground was exceptionally poor, 250 pounds of seed was sown June 24, and the crop harvested September 15, yielding 23 bushels 16 pounds per acre.

One-half acre of buckwheat of the Grey variety was grown on clay loam in a fair state of fertility, it having received manure at the rate of twenty one-horse cart loads per acre, the previous year, when a crop of roots was grown. This land was ploughed in the fall of 1902. It was sown June 19, and harvested September 10, and yielded at the rate of 35 bushels per acre.

EXPERIMENTS WITH INDIAN CORN.

Twenty-three varieties of Indian corn were planted June 2. The soil was a light clay loam and had been manured for roots in 1900, followed by grain in 1901 and clover in 1902. The land was manured in the fall of 1902 with twenty-five one-horse cart loads of stable manure per acre. This was not ploughed, however, until the following spring just before planting. The object in letting the land go without ploughing to seeding time was to get the benefit from the spring growth of clover turned under, but owing to the exceptionally dry spring the growth was very light. After ploughing, the ground was worked up by going over it once each with the spade, spring-tooth and smoothing harrows. No commercial fertilizer was used on these plots.

The corn was planted in hills and rows. One set of plots was in hills 3 feet apart each way, and a duplicate lot of plots in rows 3 feet apart. The seed sown in rows was dropped in shallow drills and covered with the hoe, and the plants were thinned to 6 inches apart in the rows. In the hills from three to five plants were left in each hill. The yield per acre is calculated from the weight obtained from two rows each 66 feet long. The crop was harvested October 6, and the following yields obtained:—

CORN—TEST OF VARIETIES.

Number.	Name of Variety.	Height.	When Tasselled.	In Silk.	Condition when Cut.	Weight per Acre grown in Rows.		Weight per Acre grown in Hills.	
		Inches.				Tons.	Lbs.	Tons.	Lbs.
1	Selected Leaming	95	Sept. 4	Sept. 25	Watery	18	850	15	250
2	Giant Prolific Ensilage	97	″ 4		Tasselling	17	1,750	17	1,530
3	Red Cob Ensilage	96	″ 4		″	17	870	15	800
4	Early Mastodon	93	″ 5	Sept. 15	Watery	17	650	17	320
5	Eureka	97	″ 5		Tasselling	17	320	16	1,550
6	Superior Fodder	96	″ 5		″	17	100	16	1,000
7	Thoroughbred White Flint	92	″ 5		″	16	1,330	16	450
8	Longfellow	90	Aug. 25	Sept. 2	Glazed	15	1,570	14	950
9	Sanford	84	″ 25	″ 3	Soft Glazed.	15	1,350	16	1,770
10	Salzer's All Gold	93	″ 25		Tasselling	15	800	12	750
11	Compton's Early	86	″ 25	Sept. 2	Glazed	14	1,370	14	1,150
12	Mammoth Cuban	95	Sept. 5	″ 15	Watery	14	1,150	15	250
13	Champion White Pearl	93	″ 5	″ 15	″	14	600	14	1,370
14	King Philip	81	Aug. 28	″ 8	″	14	600	13	1,500
15	Early Butler	92	″ 28		Tasselling	14	270	14	820
16	King of the Earliest	87	Sept. 1	Sept. 15	Watery	14	50	15	800
17	White Cap Yellow Dent	98	Aug. 29	″ 15	″	13	1,500	13	950
18	Angel of Midnight	85	″ 25	″ 3	Glazed	13	950	12	1,850
19	Pride of the North	94	Sept. 5	″ 15	Watery	12	530	12	1,850
20	North Dakota White	83	Aug. 27	″ 4	Soft Glazed.	11	1,100	11	550
21	Mammoth Eight-rowed Flint	84	Sept. 1	″ 15	Watery	11	1,100	11	
22	Cloud's Early Yellow	90	″ 3	″ 17	″	11	550	14	600
23	Evergreen Sugar	87	″ 6	″ 18	″	11		10	1,670

Six acres mixed grain. Yield per acre 72 measured bushels.

CORN SOWN IN ROWS AT DIFFERENT DISTANCES APART.

The experiment of growing corn planted in rows at different distances apart was again continued this year. The varieties of corn sown were Champion White Pearl, Selected Leaming and Longfellow. The land on which these were grown was similar to and received the same treatment in every respect as that on which the other corn plots were grown.

The seed was sown June 2, in rows 21, 28, 35 and 42 inches apart. Each plot was one-fortieth acre. The crop was harvested October 6, and the following yields per acre obtained:—

Name of Variety.	Distance Apart.	Yield Per Acre.	
	in.	Tons.	Lbs.
Selected Leaming	42	13	1,840
" "	35	15	910
" "	28	15	720
" "	21	14	905
Champion White Pearl	42	15	1,720
" "	35	17	9[illegible]0
" "	28	18	1,620
" "	21	15	725
Longfellow	42	12	1,800
"	35	15	1,960
"	28	14	432
"	21	14	20

FIELD CROPS OF CORN.

FERTILIZER EXPERIMENTS.

One acre of corn was planted in rows 3 feet apart on a light clay sandy loam. The ground was in clover in 1902. Stable manure at the rate of twenty-five one-horse cart loads per acre was spread on the sod in the fall, and this was ploughed under just before planting. The ground was worked up into good tilth with the spade, spring-tooth and smoothing harrows, and the seed was sown with the seed drill June 1. To one-third of the acre was added complete fertilizer at the rate of 500 pounds per acre, and one-third at the rate of 250 pounds per acre, and the remainder left without commercial fertilizer. The fertilizer was scattered broadcast along the rows after the seed was planted, and harrowed in with the smoothing harrow. The crop was harvested October 3 and the following yields per acre obtained. The variety Longfellow was used.

	Tons.	Lbs.
⅓ acre plot, manure and fertilizer, 500 pounds per acre...	17	1,700
⅓ " " " 250 "	15	1,500
⅓ " manure only..............................	14	700

Three acres of corn were grown on a light clay loam soil that had been previously in oats, with which Mammoth Red clover at the rate of 10 pounds per acre was sown and ploughed under in the fall of 1902. Up to this time this field had not received any stable manure. The ground was worked up in the spring with the spade and spring-tooth harrows, and stable manure at the rate of 30 one-horse cart loads per acre spread broadcast and ploughed under. This was worked up to a good tilth, and the seed sown with the seed drill on June 10, in rows 3 feet apart. To one-third of each acre was added complete fertilizer at the rate of 500 pounds per acre, and one-third 250 pounds per acre, and the remainder of the acre was left without commercial fertilizer. The commercial fertilizer was scattered broadcast along the rows after planting, and harrowed in with the smoothing harrow. One acre was planted with Compton's Early,

one with Angel of Midnight and one with Dakota White corn. The following yields were obtained from weighing the crop from each one-third acre. It was harvested October 5 to 8:—

FIELD CROP OF CORN—FERTILIZER EXPERIMENT.

Sown June 10. Harvested October 5 to 8.

Name of Variety.	Yield Per Acre.	
	Tons.	Lbs.
⅓ acre Compton's Early, manure and fertilizer, 500 lbs. per acre	16	1,500
⅓ " " " " 250 " "	14	1,200
⅓ " " " only	12	540
⅓ " Angel of Midnight, manure and fertilizer, 500 lbs. per acre	21	0
⅓ " " " " 250 " "	18	1,000
⅓ " " " only	15	1,500
⅓ " Dakota White, manure and fertilizer, 500 lbs. per acre	17	500
⅓ " " " " 250 " "	15	1,350
⅓ " " " only	12	1,140

EXPERIMENTS WITH TURNIPS.

These plots were sown May 15 and a duplicate set planted May 29. Twenty-one varieties were included in the test. The crops on both sets of plots were pulled October 27, and the yields per acre have been calculated from the yield per plot of two rows, each 66 feet long. The ground was a light clay loam and was previously in clover. The land was manured with 15 one-horse cart loads of stable manure per acre on the sod in the fall of 1902 and ploughed under. In the spring this was worked up with the spade harrow and 15 one-horse cart loads of stable manure was again applied, which was ploughed under and the ground harrowed with the spring-tooth and smoothing harrows. Two hundred pounds of complete fertilizer and 200 lbs. of bone meal per acre were sown broadcast and harrowed in with the smoothing harrow. The ground was run into rows 24 inches apart. These rows were raked off and the plots planted with the Planet Jr. No. 5 seed drill. The plants were thinned to about one foot apart in the rows, and following yields per acre obtained:—

TURNIPS—TEST OF VARIETIES.

Number	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Perfection Swede	50	320	1,672	0	43	625	1,443	45
2	Magnum Bonum	49	1,000	1,650	0	41	1,390	1,391	30
3	Halewood's Bronze Top	48	1,845	1,630	45	34	1,465	1,167	45
4	Elephant's Master	48	30	1,600	30	37	910	1.248	30
5	Selected Purple Top	47	1,370	1,589	30	40	955	1,349	15
6	Mammoth Clyde	47	1,040	1,584	0	38	1,055	1,284	15
7	Kangaroo	47	875	1,581	15	34	1,795	1,163	15
8	Emperor	47	710	1,578	30	40	25	1,333	45
9	New Century	47	50	1,567	30	38	725	1,278	45
10	Bangholm Selected	46	235	1,537	15	35	455	1,174	15
11	Jumbo	44	1,925	1,498	45	37	745	1,245	45
12	Good Luck	44	1,760	1,496	0	41	500	1,375	0
13	Skirvings	44	605	1,476	45	38	1,550	1,292	30
14	Drummond's Purple Top	43	1,120	1,452	0	35	125	1,168	45
15	Imperial Swede	43	955	1,449	15	37	85	1,234	45
16	Hall's Westbury	41	1,820	1,397	0	37	1,735	1,262	15
17	Hartley's Bronze	41	1,490	1,391	30	35	455	1,174	15
18	Shamrock Purple Top	41	1,325	1,388	45	35	1,115	1,185	15
19	East Lothian	41	665	1,377	45	36	435	1,207	15
20	Sutton's Champion	39	1,530	1,325	30	38	1,550	1,292	30
21	Carter's Elephant	39	1,365	1,322	45	32	680	1,078	0

FIELD CROPS OF TURNIPS—FERTILIZER EXPERIMENTS.

Five acres of turnips were grown on land that was of a light clay-loam character. The year previous a crop of pease was ploughed under, green. This land was exceptionally poor and had not had any stable manure previously. In the spring of 1903 the land was worked up with the spade and spring-tooth harrows, and 35 one-horse cart loads of stable manure per acre spread broadcast and ploughed under. Five varieties of turnips were sown, one acre to each sort. To one-third of each acre was added complete fertilizer at the rate of 500 lbs. per acre; to another third 250 lbs. complete fertilizer per acre, and on the remaining third no commercial fertilizer was used. The fertilizer was sown broadcast and harrowed in with the smoothing harrow before the rows were run up. The rows were made 24 inches apart. The yield from each ⅓ acre was weighed and the following crops per acre obtained :—

FIELD CROP OF TURNIPS—FERTILIZER EXPERIMENT.

Sown June 6. Harvested October 27.

Name of Variety and Size of Plot.	Yield per Acre.		Yield per Acre.	
Sutton's Champion.	Tons.	Lbs.	Bush.	Lbs.
⅓ acre—Manure and fertilizer, 500 lbs. per acre	30	1,605	1,026	45
⅓ " " " 250 "	27	1,020	917	..
⅓ " " only	28	425	940	25
Kangaroo.				
⅓ acre—Manure and fertilizer, 500 lbs. per acre	30	330	1,005	30
⅓ " " " 250 "	28	1,870	964	30
⅓ " " only	27	1,815	930	15
Hartley's Bronze.				
⅓ acre—Manure and fertilizer, 500 lbs. per acre	29	1,025	983	45
⅓ " " " 250 "	28	325	938	45
⅓ " " only	27	1,755	929	15
Elephant Swede.				
⅓ acre—Manure and fertilizer, 500 lbs. per acre	27	1,350	922	30
⅓ " " " 250 "	26	395	873	15
⅓ " " only	24	....	800	..
Rennie's Prize Purple Top.				
⅓ acre—Manure and fertilizer, 500 lbs. per acre	27	330	905	30
⅓ " " " 250 "	26	1,610	893	30
⅓ " " only	26	1,880	898	..

EXPERIMENTS WITH MANGELS.

Sixteen varieties of mangels were sown May 15, and a duplicate set sown May 29, two weeks later. Each plot was two rows, each 66 feet long. The land on which these were grown was adjoining the turnip plots and received the same treatment in every respect. The rows were 24 inches apart. They were raked off and the seed sown in bunches one foot apart with the Planet Jr. seed drill No. 5. The crop of both sets of plots was harvested October 21, and the following yields were obtained. On account of the extremely dry weather at planting time the seed germinated very irregularly and quite a number of the plants were destroyed by the cutworm when from 3 to 5 inches high :—

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre, 1st Plot.		Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth Yellow Intermediate........	46	1,225	1,554	25	37	745	1,245	45
2	Lion Yellow Intermediate.......	46	235	1,537	15	41	5	1,366	45
3	Giant Yellow Intermediate....................	45	1,575	1,526	15	36	600	1,210	..
4	Giant Yellow Globe.....	45	585	1,509	45	36	1,425	1,223	45
5	Prize Mammoth Long Red	45	255	1,504	15	37	1,240	1,254	..
6	Selected Yellow Globe	45	90	1,501	30	35	475	1,174	35
7	Prize Winner Yellow Globe	43	1,450	1,457	30	37	415	1,240	15
8	Selected Mammoth Long Red..................	43	1,120	1,452	..	39	1,365	1,322	45
9	Leviathan Long Red..............................	42	1,800	1,430	..	35	125	1,168	45
10	Triumph Yellow Globe..	41	1,325	1,388	45	30	225	1,003	45
11	Half Long Sugar Rosy.........................	41	170	1,369	30	32	185	1,069	45
12	Mammoth Long Red............................	41	5	1,366	45	36	1,755	1,229	15
13	Half Long Sugar White........................	40	1,675	1,361	15	30	1,710	1,028	30
14	Yellow Intermediate......	40	850	1,347	30	32	1,175	1,086	15
15	Giant Sugar Mangel...............	33	495	1,108	15	25	985	849	45
16	Gate Post....................................	32	1,670	1,094	30	22	550	742	30

FIELD CROP OF MANGELS—TEST OF VARIETIES.

The land on which these were grown was previously in clover, and was ploughed in the fall of 1902. The soil was a light clay loam. The ground was worked up with the spade and spring-tooth harrows in the spring of 1903, and stable manure at the rate of twenty-five one-horse cart loads per acre spread broadcast and ploughed under. This was worked up to a good tilth and 250 lbs. of complete fertilizer per acre sown broadcast and harrowed in with the smoothing harrow before the rows were run. The rows were made with the double mould-board plough 24 inches apart. The rows were raked off by hand and the mangel seed at the rate of 8 lbs. per acre, sown in bunches one foot apart with the hand Planet Jr. seed drill No. 5. Three varieties of mangels were sown, one half acre each. Owing to the continued dry spring the seed germinated slowly and irregularly. The cutworms did considerable damage to the young plants, leaving a number of blanks. The entire yield of each variety was weighed and the following crops per acre obtained. The seed was sown May 16, harvested October 19 and 20.

FIELD CROP OF MANGELS—TEST OF VARIETIES.

Manure and fertilizer 250 lbs. per acre.	Yield per acre.			
	Tons.	lbs.	Bush.	lbs.
Mammoth Long Red..	21	936	715	36
Giant Yellow Half Long....	20	1,100	685	..
Giant Yellow Globe........................	19	1,300	655	..

FIELD CROP OF MANGELS—FERTILIZER EXPERIMENTS.

The land on which these were grown was a light clay loam. The previous crop was oats, with which 10 lbs. Mammoth Red Clover was sown per acre, and what

growth it made was ploughed under in the fall of 1902. This was worked up in the spring with the spade and spring-tooth harrows, and 30 one-horse cart loads of stable manure per acre spread broadcast and ploughed under. The land was then worked up into good tilth. Three varieties were grown in ¾ acre lots. One-third of each lot had complete fertilizer added at the rate of 500 lbs. per acre sown broadcast ; one-third complete fertilizer at the rate of 250 lbs. per acre, and the remaining third no commercial fertilizer. The fertilizer was sown broadcast and harrowed in with the smoothing harrow, before the rows were run 24 inches apart. The seed germinated slowly and the plants came up irregularly, due to the dry weather. The seed was sown May 26 and harvested October 19 and 20. The following yields per acre were obtained.

FIELD CROP OF MANGELS—FERTILIZER EXPERIMENT.

—	Yield per Acre		Yield per Acre	
	Tons.	lbs.	Bush.	lbs.
MAMMOTH LONG RED.				
⅓ acre—Manure and fertilizer, 500 lbs. per acre	25	250	837	30
⅓ " " " 250 "	24	350	805	50
⅓ " " only	23	1,750	795	50
GIANT YELLOW HALF LONG.				
⅓ acre—Manure and fertilizer, 500 lbs. per acre	28	1,250	954	10
⅓ " " " 250 "	28	250	937	30
⅓ " " only	26	....	866	40
GIANT YELLOW GLOBE.				
⅓ acre—Manure and fertilizer, 500 lbs. per acre	19	1,350	656	10
⅓ " " " 250 "	18	450	607	10
⅓ " " only	21	100	701	40

EXPERIMENTS WITH CARROTS.

The plots chosen for this test were similar in every respect and received the same treatment as the turnip and mangel plots. Eleven varieties were sown. One set of plots on May 15 and a duplicate set on May 29. The rows were 24 inches apart. They were raked off by hand and the seed was sown with the Planet Jr. No. 5 seed drill. Each plot was two rows, 66 feet long. They were harvested October 27 and gave the following yields :—

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Ontario Champion	30	225	1003	25	22	1,375	756	15
2	Giant White Vosges	29	905	981	45	19	1,600	660	..
3	Mammoth White Intermediate	27	615	910	15	24	675	811	15
4	New White Intermediate	24	675	811	15	22	880	748	..
5	Half Long Chantenay	23	200	770	..	18	300	605	..
6	Long Yellow Stump rooted	22	880	748	..	21	1,375	723	15
7	Improved Short White	20	1,580	693	..	20	920	682	..
8	Early Gem	19	1105	651	45	19	445	640	45
9	Half Long White	19	415	640	15	18	1,620	627	..
10	White Belgian	18	1,950	632	30	17	155	569	15
11	Carter's Orange Giant	17	650	577	30	15	1,350	522	30

EXPERIMENTS WITH SUGAR BEETS.

Eight varieties of sugar beets were planted in plots consisting of two rows each 66 feet long, on May 15, and duplicate ones on May 29. These were on land similar in every respect and receiving the same treatment as the turnip, mangel and carrot plots. The seed was sown in rows 24 inches apart. The rows were raked off and the seed sown in bunches one foot apart, with the Planet Jr. No. 5 seed drill. The crop was gathered October 22 and the following yield obtained:—

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Royal Giant	37	415	1,204	15	30	390	1,006	30
2	Danish Red Top	31	40	1,034	0	21	1,395	723	15
3	Red Top Sugar	29	575	976	15	19	445	640	45
4	Vilmorin's Improved	28	925	948	45	24	675	811	15
5	Improved Imperial	28	595	943	15	18	1,620	627	0
6	Danish Improved	28	265	937	45	22	1,375	756	15
7	Wanzleben	24	1,005	816	45	20	425	673	45
8	French 'Very Rich'	21	75	701	15	17	650	577	30

EXPERIMENTS WITH POTATOES.

The land on which these were grown was clay loam, having been in timothy and clover the year before. The ground was manured with 20 one-horse cart loads of stable manure per acre in the fall of 1902, and ploughed under. This was worked up in the spring following, with the spade, spring-tooth and smoothing harrows and ploughed again. Rows were run 30 inches apart and from 3 to 5 inches deep, and potato fertilizer at the rate of 300 lbs. per acre sown in the rows before the planting was begun. The sets were planted May 22 one foot apart in the rows and covered with the plough. The tubers were cut so as to have from two to three eyes in each piece. The drills were harrowed down once before the plants were above the ground, to destroy weeds, and again drilled up in a few days and kept loose with a cultivator until the vines were quite large. An unusual number of sets rotted in the ground, making the plots somewhat irregular. The plots were sprayed with bordeaux mixture and paris green com-

bined July 21, August 8, and August 28. The potato blight did not strike these plots, which kept green throughout the whole season, while considerable damage was done by late blight in surrounding districts.

Fifty-five varieties were included in this test. Each plot consisted of two rows, each 66 feet long. The crop was harvested September 25, and the following yields obtained:—

POTATOES—TEST OF VARIETIES.

Number.	Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable.		Description of Variety, Form and Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Pearce	Medium	605	0	572	0	33	0	Long, pink and white.
2	Vanier	"	550	0	451	0	99	0	Long, dark pink.
3	Vick's Extra Early	Good	534	36	451	0	83	36	Oval, pink.
4	Seedling No. 7	Medium	528	0	448	48	79	12	"
4	McIntyre	"	517	0	462	0	55	0	Long, blue and white.
6	Enormous	"	506	0	446	36	59	24	Oblong, white.
7	Rochester Rose	"	495	0	444	24	50	36	Oblong, pink.
8	Clay Rose	"	492	48	444	36	46	12	Round, pink.
9	Everett	Good	433	24	356	24	77	0	Flat, round pink.
10	Troy Seedling	Medium	429	0	319	0	110	0	Round, white.
11	Penn Manor	"	418	0	297	0	121	0	Long, pink.
12	Burnaby Seedling	"	411	24	352	0	59	24	Round, pink.
13	Late Puritan	"	407	0	374	0	33	0	Long, white.
14	Early Envoy	"	407	0	352	0	55	0	Oblong, pink.
15	Swiss Snowflake	"	404	48	360	48	44	0	Round, white.
16	Rose No. 9	Good	378	24	341	0	37	24	Oblong, pink.
17	Maule's Thoroughbred	Medium	374	0	330	0	44	0	Long, pink.
18	Early Puritan	Good	367	24	314	36	52	48	Long, pink and white.
19	Early Norther	"	365	12	316	48	48	24	Long, white.
20	I. X. L	Medium	363	0	314	36	48	24	Long, pink and white.
21	Irish Cobbler	Good	358	36	297	0	61	36	Round, white.
22	Bovee	"	347	36	297	0	50	36	Oblong, pink and white.
23	State of Maine	"	345	24	297	0	48	24	Round, flat and white.
24	Sharpe's Seedling	Medium	341	0	301	24	39	36	Long, white.
25	Up to Date	"	336	36	297	0	39	36	Long, flat, white.
26	Delaware	Good	330	0	286	0	44	0	Round, flat, white.
27	Pingree	Medium	325	36	272	48	52	48	Oblong, white.
28	Empire State	Good	314	36	268	24	46	12	Long, white.
29	Canadian Beauty	"	312	24	279	24	33	0	Long, round, pink and white.
30	Early Andes	"	310	12	250	48	59	24	Oblong, pink.
31	Green Mountain	"	308	0	257	24	50	36	Round, white.
32	Uncle Sam	"	308	0	275	0	33	0	"
33	Sabean's Elephant	Medium	301	24	268	24	33	0	Long, round, white.
34	Holborn Abundance	"	297	0	253	0	44	0	Round, white.
35	Irish Daisy	"	294	48	242	0	52	48	Oblong white.
36	Brown's Rot Proof	"	286	0	220	0	66	0	"
37	Money Maker	Good	272	48	220	0	52	48	Long, white.
38	Carman No. 3	"	270	36	237	36	33	0	Round, flat, white.
39	Early White Prize	"	264	0	231	0	33	0	Long, white.
40	Dreer's Standard	"	259	36	220	0	39	36	Oblong, white.
41	Early Rose	"	253	0	209	0	44	0	Long, pink.
42	Prolific Rose	"	250	48	213	24	37	24	"
43	American Wonder	"	248	36	213	24	35	12	Long, white.
44	Reeve's Rose	"	242	0	187	0	55	0	Long, pink.
45	American Giant	Medium	235	24	191	24	44	0	"
46	Cambridge Russet	"	231	0	198	0	33	0	Long, white.
47	Early St. George	Good	231	0	198	0	33	0	Long, pink.
48	Early Sunrise	"	228	48	182	36	46	12	"
49	Country Gentleman	"	228	48	191	24	37	24	Long, pink and white.
50	Carman No. 1	"	226	36	191	24	35	12	Round, flat and white.
51	General Gordon	Medium	222	12	171	36	50	36	Long, pink.
52	Lee's Favourite	"	222	12	162	48	59	24	Long, pink and white.
53	Burpee's Extra Early	Good	202	24	165	0	37	24	Long, round, pink and white.
54	Early Michigan	"	202	24	160	36	41	48	Oblong, white.
55	Rawdon Rose	"	198	0	169	24	28	36	Oblong, pink and white.

POTATOES—NOT IN UNIFORM TEST PLOTS.

Number.	Name of Variety.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable.		Date of Planting.	Date of Digging.	Form and Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.			
1	Peachblow	539	0	495	0	44	0	May 22.	Sept. 25.	Oval, light red.
2	Shenango	446	36	396	0	50	36	" 22.	" 25.	Long, blue and white.
3	Garnet Chili	440	0	385	0	55	0	" 22.	" 25.	Round, light red.
4	Thorburn	429	0	330	0	99	0	" 22.	" 25.	Long, pink and white.
5	Dark Blue	426	48	391	36	35	12	" 22.	" 25.	Round, flat, blue.
6	Rural No. 2	407	0	374	0	33	0	" 22.	" 25.	Round, white.
7	Quaker City	352	0	308	0	44	0	" 22.	" 25.	Round, white.
8	Sir Walter Raleigh	330	0	297	0	33	0	" 22.	" 25.	Round, flat, white.
9	White Beauty	259	36	209	0	50	36	" 22.	" 25.	Long, pink and white.

FLAX—TEST OF VARIETIES.

Two varieties of flax were grown on a clay loam soil which was in mangels the previous year. The land was ploughed in the fall of 1902 and worked up to a good tilth in the spring of 1903, and the seed sown with the seed drill at the rate of 30 lbs. per acre June 12. The plots were one-twentieth acre each and were harvested September 3. The following yields were obtained :—

	Weight per Bushel.	Yield per Acre.
	Lbs.	Bush.
Riga Flax	50	22
White Russian Flax	50	24

EXPERIMENTS WITH SOJA BEANS.

The soil selected for these plots was a heavy clay loam. The previous crop was oats and vetches for green feed, the land having been manured for that crop in the spring of 1902 with 25 one-horse cart loads of stable manure per acre. It was ploughed in the fall of 1902 and this spring was worked up by ploughing and harrowing with the spring-tooth and smoothing harrows. The beans were sown with the Wisner seed drill June 13 in rows 21, 28 and 35 inches apart. The crop was cut and weighed October 6.

The object of this experiment is to obtain information as to the value of this plant as a forage crop, and to ascertain the yields per acre from seed sown in rows at different distances apart. The plots were one-fortieth acre each. The crop made only fair growth and did not mature well.

	Yield per Acre.	
	Tons.	Lbs.
Soja Beans, 21 inches apart	6	200
" 28 "	5	1,600
" 35 "	5	1,000

EXPERIMENTS WITH HORSE BEANS.

The land on which these were grown was similar to that used for the Soja Beans, and received the same treatment. The beans were sown with the seed drill June 13 in rows 21, 28 and 35 inches apart. The variety 'Tick' was used. Each plot was one-fortieth acre. The plants, on account of the cool summer, did not mature as well as usual. The following yields per acre were obtained from the crop harvested October 6 :—

	Yield per Acre. Tons.	Lbs.
Horse Beans, 21 inches apart	15	800
" 28 "	14	680
" 35 "	12	1,400

CLOV"R EXPERIMENTS.

The object in view in these experiments was to show the value of growing clover with grain crops, and determine the gain, if any, from, ploughing the clover of one year's growth under for future crops. Another object sought this year was to find out whether the yield of grain would be affected by the clover growing with it. On account of this season being an exceptionally dry one, the growth of clover was less than usual, and it may be well to repeat these experiments next year, with the same object in view. The Mammoth Red Clover was sown with the grain at seeding time at the rate of 10 lbs. per acre, by means of a seeding attachment to the grain seed drill. The grain was sown May 13; the barley was harvested August 18, the oats September 3 and the wheat September 8. The plots were one-twentieth acre each. The land was a clay loam in a good state of fertility, having been in roots the previous year, being manured for that crop with 25 one-horse cartloads of stable manure per acre. The following grains were grown, giving the following yields :—

	Yield per Acre. Bush.	Lbs.
Plot Banner Oats—		
No. 1, without clover	98	28
No. 2, with clover	104	14
No. 3, without clover	111	6
No. 4, with clover	102	17
Plot White Fife Wheat—		
No. 1, without clover	41	..
No. 2, with clover	39	30
No. 3, without clover	41	40
No. 4, with clover	40	20
Plot Odessa Barley—		
No. 1, without clover	59	28
No. 2, with clover	59	38
No. 3, without clover	61	12
No. 4, with clover	60	40

SPECIAL EXPERIMENTS WITH FERTILIZERS.

These experiments which have been conducted for the past four years were continued this year. The object of these tests is to ascertain the relative usefulness of fertilizers commonly used for field crops of various kinds. The plots were one-eighth acre each, 38 x 143½ feet for each kind of fertilizer used. These were subdivided into ten strips 14 feet wide, each running lengthwise across all the different fertilized plots. These strips were sown with ten different kinds of crops, namely, potatoes, turnips, carrots, mangels, oats, wheat, barley, pease, corn and mixed grain, making in all 140 plots. A margin of two feet was left between each plot and one foot between each crop plot. Two plots were left without any fertilizer to serve as check plots. The strips that are in grain one year are planted to roots, potatoes and corn the following

year. The quantity and kind of fertilizer used is applied each year. Each of the crops were sown at the same time as the uniform test plots, with the same amount of seed per acre, and were cultivated in the same manner. The following table gives the yield per acre of these various crops :—

Fertilizer Used per acre.	Barley, Canadian Thorpe.		Oats, Tartar King.		Wheat, Colorado.		Barley, oats and pease.		Pease, Golden Vine.		Corn, Longfellow.		Turnips, Purple Top.		Mangels, Giant Yellow Intermediate.		Carrots, Half Long White.		Potatoes, Delaware.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Manure, 30 tons	62	4	54	8	36	40	57	20	51	40	12	500	30	1,500	33	1,300	21	1,800	380	
Manure, 15 tons, fertilizer, 250 lbs.	60	0	50	0	33	20	55		53	20	12	1,000	31	1,500	33	200	22	100	370	
Complete fertilizer, 1,000 lbs	45	40	39	28	30		47	20	48	20	11	500	23		18	1,500	19	400	328	20
Complete fertilizer, 500 lbs	41	32	37	24	28	20	42	10	48	20	10	1,000	22	1,000	18	200	20	500	306	40
Check....	37	24	27	4	23	20	37	20	38	20	6	700	17	1,500	11	1,500	14	900	196	40
Bone meal, 1,000 lbs.....	43	36	39	28	26	40	50		46	40	10	1,500	30		22		17	600	290	
" 500 "	47	44	37	24	25		47	20	50		10	1,200	29		19	800	15	1,200	260	
Ashes 2,500 " ...	52	4	35	20	28	40	50		50		11	700	25	500	21	700	18	400	435	
Manure, rotted, 20 tons..	68	36	58	16	41	40	70		58	20	14	500	32	1,000	34	1,300	21	1,900	540	
Check................	39	28	25		13	20	25		33	20	5		4	500	1	500	5	1,700	228	20
Land plaster, 500 lbs.....	41	32	27	4	16	40	30		30		6	1,500	6	700	1	700	6	400	203	20
Salt, 500 "	45	40	33	16	20		43	30	36	40	7		21	1,500	7	500	13	1,800	175	
Marsh mud, 100 tons....	62	24	41	32	25		50		40		10	1,500	23		27	600	21	1,300	223	20
Manure, green, 20 "	72	44	62	24	43	20	67	20	56	40	13	1,700	35	500	43	200	28	900	483	20

HAY.

The crop of timothy and clover hay was light—twenty-four acres of upland yielded 44 tons 837 lbs.

Twelve acres of underdrained marsh land yielded 18 tons 1,775 lbs., and 33 acres, not underdrained, yielded 39 tons 660 lbs. This made a total of 102 tons 1,272 lbs. about one-third less than an average crop. This was all secured in good condition.

SUMMARY OF CROPS ON EXPERIMENTAL FARM, NAPPAN.

Grain Field Crops.	Bushels.
Oats..	291
Barley..	56½
Mixed grain..	812
Buckwheat..	124½
	1,284

From Uniform Trial Plots.	Bushels.
Oats..	96
Wheat..	46
Barley..	42½
Pease..	24½
Buckwheat..	3½
	212½

Roots, &c., Field Crops.	Bushels.
Turnips	4,609
Mangels	2,818
	7,427

From Uniform Trial Plots.	Bushels.
Turnips	408
Mangels	216
Carrots	102
Sugar beets	86
Potatoes	237
	1,049

Indian Corn Cut Green for Ensilage.	Tons.
Field crops	63½
From uniform trial plots	2½
	66

	Tons.	Lbs.
Hay	102	1,272

GRAIN AND POTATO DISTRIBUTION.

Some of the most promising varieties of grain and potatoes were again distributed this year to farmers who made application. The following number of three-pound packages were sent out for trial :—

Potatoes	354
Oats	212
Barley	62
Wheat	68
Pease	42
Buckwheat	16
Rye	1
Total	755

EXHIBITIONS, AGRICULTURAL MEETINGS AND EXCURSIONS TO FARM

An exhibit was made of farm produce at the Nova Scotia provincial exhibition, Halifax, September 9 to 17; at Fredericton, N.B., September 21 to 26, and Sussex, N.B., September 30 to October 1. Charlottetown, P.E.I., was unavoidably omitted on account of its being on the same date as Fredericton, and as no exhibit of experi-

mental farm products had ever been made at Fredericton it was thought best to give that place the preference.

I have attended and given addresses at quite a number of agricultural meetings throughout the provinces of Nova Scotia and New Brunswick during the year, besides delivering a series of lectures to the students at the Sussex, N.B., dairy school in March.

As in other years, many visitors have visited the farm, and there have been several farmers' excursions, the largest of which was that of the Pictou County Farmers' Association on July 9, when about 1,200 were present. Smaller excursions from the surrounding country, of about 20 to 100 persons, have been common. Although railway rates are quite reasonable for large excursions, smaller parties do not find the rates so favourable, and the fact of no hotel accommodation being available, no doubt tends to hinder many from visiting the farm.

CORRESPONDENCE.

During the year 1,840 letters were received and 1,685 sent out.

HORSES.

The stock of horses at present on the farm consists of three teams of heavy working horses, one express horse and one driver. Total, 8. One draught horse was bought during the year. All are in good condition.

CATTLE.

The herd of dairy cattle on the farm at present numbers 46 head, as follows:—

1 Guernsey bull, 5 years old.
1 Ayrshire bull, 2½ years old.
1 Jersey cow.
3 Holstein cows.
2 Guernsey cows.
1 Guernsey heifer, 2½ years old.
5 Ayrshire cows.
2 Ayrshire heifers, 1½ years.
4 Grade Ayrshire heifers, 2½ years.
16 Grade milch cows.
3 Ayrshire heifers, 8 to 10 months.
1 Holstein heifer, 8 months.
8 Grade Ayr. heifers 8 to 10 mos.

Steers have also been secured for experiment to the number of 36, as follows:—

12 three-year-old steers, short-horn grades.
9 two-year-old steers, short-horn grades.
10 one-year-old steers, short-horn grades.
5 steer calves, short-horn grades.

Total number of cattle, 82.

EXPERIMENT WITH DAIRY COWS.

This experiment was again carried on with a view to further determine whether a fairly good dairy herd, well fed and cared for, would leave a credit balance after paying for feed consumed, their milk being sent to the creamery and their food being charged at current market price.

The different feeds were charged at the following prices:—Wheat, bran, $20 per ton; oats, $25 per ton; oil cake, $33 per ton; gluten meal, $28 per ton; making an average price of mixed meal ration, as per proportion fed to cows, of 1⅕c. per pound. Roots at $2 per ton, ensilage at $2 per ton, and hay at $8 per ton.

The ration fed to cows in full milk was: Ensilage or roots, 50 lbs.; meal, 10 lbs; hay, 10 lbs., making a cost of 21 cents per cow per day.

In summer months, while milking, they were charged $2.50 per month, and when dry $1 per month.

When dry in winter they were charged $3 per month. Different quantities were fed to different cows, according to their capacity to consume and produce, and charged accordingly.

They were kept in the stable from November 1, 1902, to June 1, 1903, except on occasional fine days, when they were allowed out in the yard.

They were fed, watered and milked each day at as nearly regular intervals as possible, and by the same persons.

The summer feed was practically all summer soiling crops, rye, clover, oats, pease and vetches, grown together and sown at different times.

The milk of each cow was weighed at milking twice each day, and a careful record kept of the number of pounds given.

The percentage of fat in the milk of each cow was determined by the Babcock milk tester, and the fat credited to the cows on the basis that 85 pounds of fat produces 100 pounds of marketable butter.

The milk was sent to the Nappan dairy station, and the cows were credited with the butter produced at the prices paid to all patrons of that station, which averaged for the winter months 24c. per pound and for the summer months 21⅓c. per pound, which, after deducting 4 cents per pound for manufacturing and hauling milk, leaves 20 cents per pound for winter butter and 17⅓ cents per pound for summer butter.

The skim-milk was fed to calves and pigs, and credited to the cows at the rate of 15 cents per 100 pounds.

The following table will show the results obtained during the year :—

Name.	Age.	Breed.	Date of Dropping last Calf.	Days in Milk.	Milk.	Fat.	Butter.	Value Skim Milk	Total Credit.	Cost Feed.	Cost making Butter at 4 c. p. lb.	Total Cost	Profit.
					Lbs.	p. c.	Lbs.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Eva Rooker	8 yrs.	Holstein	Jan. 1, 1903	285	10,040	3·3	389·78	10 04	100 95	50 75	15 59	66 34	34 61
Corie	6 "	Ayrsh. Grade	Dec. 15, 1902	310	10,010	3·6	400·40	10 01	103 21	53 30	16 01	69 31	33 90
Aiton	8 "	"	Jan. 1, 1903	270	8,860	3·6	375·24	8 86	95 93	50 00	15 00	65 00	30 93
Molly	10 "	"	" 3, 1903	270	8,530	3·8	369·56	8 53	94 33	50 00	14 78	64 78	29 55
Lucy	10 "	"	Feb. 1, 1903	245	8,110	3·5	333·93	8 11	86 04	46 40	13 35	59 75	26 29
Curly	4 "	Ay. Gn. Grade	Dec. 1, 1902	240	6,920	4·0	325·64	6 92	82 43	45 00	13 02	58 02	24 41
Ilda Rooker	4 "	Holstein	" 10, 1902	280	8,850	3·3	343·58	8 85	88 55	51 80	13 74	65 54	23 01
Rex's Maud	8 "	Guernsey	" 20, 1902	285	6,110	4·7	337·82	6 11	85 29	50 15	13 51	63 66	21 63
Carrie	10 "	Ayrsh. Grade	Feb. 1, 1903	260	7,140	3·7	310·79	7 14	79 82	47 90	12 43	60 33	19 49
Sonsy	7 "	Ayrshire	" 1, 1903	270	7,110	3·6	301·12	7 11	75 71	46 70	12 04	58 74	16 97
Yellow Kate	3 "	"	Jan. 1, 1903	300	7,300	3·6	309·17	7 30	79 24	50 00	12 36	62 36	16 88
Daisy	8 "	Ayrsh. Grade	" 1, 1903	270	7,340	3·4	293·60	7 34	75 63	48 50	11 74	60 24	15 39
Jessie P	9 "	"	March 4, 1903	260	6,810	3·6	288·42	6 81	72 85	46 70	11 53	58 23	14 62
Rae	2½ "	Ay. Gn. Grade	Dec. 1, 1902	270	5,970	3·9	273·91	5 97	69 73	48 50	10 95	59 45	10 28
Lizzie	2⅓ "	"	" 1, 1902	270	5,810	3·9	266·57	5 81	67 64	48 50	10 66	59 16	8 48
Blue Bell	2½ "	Ayrsh. Grade	" 1, 1902	270	5,910	3·6	250·29	5 91	63 93	48 50	10 01	58 51	5 42
Betsy	2½ "	" "	" 1, 1902	270	5,740	3·5	236·35	5 74	60 70	48 50	9 45	57 95	2 75
Rose	10 "	Jersey Grade	Mar. 15, 1903	255	5,400	3·8	241·17	5 40	57 91	46 10	9 64	56 64	2 17
Mary	10 "	HolsteinGrade	April 1, 1903	240	5,540	3·4	221·60	5 54	53 67	44 30	8 86	53 16	0 51
Ida B	11 "	Ayrsh. Grade	" 1, 1903	240	5,240	3·6	221·92	5 24	53 41	44 30	8 87	53 17	0 24

EXPERIMENTS WITH STEERS.

TIED IN STALLS *vs.* FED IN LOOSE BOX.

This experiment was again carried on with the view of testing the advisability of feeding in loose boxes, as contrasted with similar steers fed tied in stalls.

Sixteen three-year-old steers were used for this test in two lots of eight each, of as nearly as possible equal form, fatness and weight (Shorthorn grades.)

All weights were taken after a fast of 14 hours, that is, at 9 a.m., without feed.

All were dehorned previous to beginning of test.

All lots were fed alike, as nearly as possible, from start to finish of test, and kept in the stable all the time, except on occasional fine days, when they were let out for a time, averaging not more than once a week.

The feeds were charged at the following prices: Hay, $8 per ton; roots, $2 per ton; ensilage, $2 per ton; mixed meals averaged $24 per ton; as per proportion fed.

Record of steers fed from Dec. 1, 1902, to April 30, 1903.

EXPERIMENT I—LOT I—DEHORNED, FED IN LOOSE BOX.

Numbers.	Dec. 1.	Dec. 31.	Gain.	Jan. 30.	Gain.	Mar. 1.	Gain.	Mar. 31.	Gain.	Apr. 30.	Gain.	Total Gain.
	Lbs.	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.
9	1,240	1,310	70	1,370	60	1,450	80	1,510	60	1,555	45	315
10	1,260	1,340	80	1,400	60	1,450	50	1,500	50	1,540	40	280
11	1,285	1,370	85	1,440	70	1,500	60	1,550	50	1,585	35	300
12	1,265	1,360	95	1,450	90	1,510	60	1,570	60	1,600	30	335
13	1,220	1,320	100	1,400	80	1,475	75	1,520	45	1,550	30	330
14	1,240	1,330	90	1,410	80	1,480	70	1,530	50	1,545	15	305
15	1,170	1,230	60	1,300	70	1,340	40	1,375	35	1,400	25	230
16	1,100	1,200	100	1,260	60	1,340	80	1,400	60	1,440	40	340
	9,780	10,460	680	11,030	570	11,545	515	11,955	410	12,215	260	2,435

EXPERIMENT I—LOT II—DEHORNED, TIED IN STALLS.

1	1,545	1,625	80	1,700	75	1,770	70	1,810	40	1,855	45	310
2	1,335	1,440	105	1,510	70	1,580	70	1,640	60	1,665	25	330
3	1,200	1,260	60	1,325	65	1,400	75	1,470	70	1,510	40	310
4	1,150	1,200	50	1,240	40	1,300	60	1,350	50	1,385	35	235
5	1,120	1,190	70	1,230	40	1,280	50	1,320	40	1,340	20	220
6	1,160	1,220	60	1,270	50	1,330	60	1,400	70	1,435	35	275
7	1,200	1,290	90	1,350	60	1,400	50	1,450	50	1,490	40	290
8	1,060	1,140	80	1,200	60	1,260	60	1,310	50	1,340	30	280
	9,770	10,365	595	10,825	460	11,320	495	11,750	430	12,020	270	2,250

EXPERIMENT I—AVERAGE COST OF 1 STEER PER DAY FOR ENTIRE PERIOD.

Period.	Daily Ration.	Daily Cost.	Cost for Period.	Total.
		\$ cts.	\$ cts.	\$ cts.
1902.				
Dec. 1 to Dec. 31	Roots 90 lbs.	0 09	2 70	
	Hay 10 "	0 03$\frac{3}{5}$	1 08	
	Meal 3 "	0 04	1 20	4 90
1903.				
Dec. 31 to Jan. 30	Roots 60 lbs.	0 04	1 80	
	Hay 10 "	0 04	1 20	
	Meal 4 "	0 04$\frac{4}{5}$	1 44	4 44
Jan. 30 to Mar. 1	Roots 40 lbs.	0 04	1 20	
	Hay 12 "	0 04$\frac{4}{5}$	1 44	
	Meal 6 "	0 07$\frac{1}{5}$	2 16	4 80
Mar. 1 to Mar. 31	Roots 30 lbs.	0 03	0 90	
	Hay 15 "	0 C6	1 80	
	Meal 8 "	0 09$\frac{3}{5}$	2 88	5 58
Mar. 31 to April 30	Roots 20 lbs.	0 02	0 60	
	Hay 15 "	0 06	1 80	
	Meal 10 "	0 12	3 60	6 00
Cost of feed 1 steer				25 72
" 16 steers				411 52

SUMMARY OF EXPERIMENT 1.

Financial Part.

Original weight of 16 steers, 19,550 lbs., at 4⅛c. per lb.	\$	806 18
Weight at finish of 16 steers, 24,235 lbs. at 5¼c.		1,272 33
Balance	\$	466 15
Cost of feed for lot, 150 days		411 52
Net profit	\$	54 63
Daily rate of gain per steer	Lbs.	1·94
Cost of 1-lb. gain	Cts.	8·78
Cost of feed per day per steer	"	17·14
Profit per steer		\$3.41

STEER-CALF EXPERIMENTS.

(Continued from December 1, 1902.)

This experiment, with a view to determine the comparative economy of feeding calves a full fattening ration from the start, as contrasted with a limited growing ration, begun in 1901 and repeated in 1902, was continued with 10 calves in each experiment, in two lots of five each. Those commenced in 1901, termed experiment 1, being continued so. Those commenced in 1902, termed experiment 11, also continued so.

Owing to the difficulty in securing suitable calves for this experiment, it was not repeated in the spring of 1903, but suitable calves were secured December 1 at six months old, and were put in at that age and date, with a view to continuing this experiment from that age instead of from birth.

In estimating the cost of feeding calves, the following values were placed on the different feeds:—Wheat bran, $20 per ton; crushed oats, $24 per ton; oil cake, $33 per ton; gluten meal, $28 per ton; roots or ensilage, $2 per ton; hay, $8 per ton; straw, $4 per ton.

STEER CALF EXPERIMENT.

EXPERIMENT 1.—Continued from December 1, 1902.

The full fattening lot of this experiment were considered finished April 30, 1903, and sold. The limited growing lot will be kept until April 30, 1904, when they are expected to be finished, when a comparison of the relative cost from birth to block can be made.

The following tables show the gains per month and the amount of food consumed:

EXPERIMENT I.—FULL FATTENING RATION. CALVES MAY 1901, CONTINUED FROM DECEMBER 1, 1902.

Lot I.	Weight at Start.	Weight at Finish.	Gain.
Period.	Lbs.	Lbs.	Lbs.
December 1 to December 31	4,620	4,955	335
December 31 to January 30	4,955	5,335	380
January 30 to March 1	5,335	5,735	400
March 1 to March 31	5,735	6,095	360
March 31 to April 30	6,095	6,355	260

Period.	Daily Ration.	Daily Cost.	Cost for Period.	Total.
		$ cts.	$ cts.	$ cts.
December 1 to December 31	Roots, 60 lbs.	0 06	1 20	
	Hay, 8 lbs.	0 03⅕	0 96	
	Meal, 3 lbs.	0 04	1 20	3 36
December 31 to January 30	Roots, 60 lbs.	0 06	1 80	
	Hay, 10 lbs.	0 04	1 20	
	Meal, 4 lbs.	0 04⅘	1 44	4 44
January 30 to March 1	Roots, 40 lbs.	0 04	1 20	
	Hay, 10 lbs.	0 04	1 20	
	Meal, 5 lbs.	0 06	1 80	4 20
March 1 to March 31	Roots, 30 lbs.	0 03	0 90	
	Hay, 10 lbs.	0 04	1 20	
	Meal, 6 lbs.	0 07⅕	2 16	4 26
March 31 to April 30	Roots, 20 lbs.	0 02	0 60	
	Hay, 12 lbs.	0 04⅘	1 44	
	Meal, 7 lbs.	0 08⅖	2 52	4 56

SUMMARY OF EXPERIMENT 1.

	Lbs.
Weight at start, Dec. 1, 1902, 5 steers	4,620
Weight at finish, April 1, 1903, 5 steers	6,355
Gain for period	1,735
Daily rate of gain per steer	2·32
Cost of feed per day per steer $	0 12·54
Cost of 1-lb. gain	0 06
Cost of feed for lot, 150 days	104 10

EXPERIMENT I.—LIMITED GROWING RATION. CALVES MAY 1901. CONTINUED FROM DECEMBER 1, 1902.

Lot II.	Weight at Start.	Weight at Finish.	Gain.
Period.	Lbs.	Lbs.	Lbs.
December 1 to December 31, 1902	3,485	3,665	180
December 31 to January 30	3,665	3,840	175
January 30 to March 1	3,840	4,000	160
March 1 to March 31	4,000	4,190	190
March 31 to April 30	4,160	4,395	205
April 30 to May 30	4.395	4,495	100
May 30 to November 1	4,495	4,700	205
November 1 to December 1	4,700	5,160	460

EXPERIMENT I.—LIMITED GROWING RATION.—CONTINUED FROM DECEMBER 1, 1902. LOT II.

Period.	Daily Ration.	Daily Cost.	Cost for Period.	Total.
		$ cts.	$ cts.	$ cts.
December 1 to December 31	Roots, 40 lbs	0 04	1 20	
	Hay, 2 lbs	0 00⅘	0 24	
	Straw, 5 lbs	0 00²⁄₁₀	0 06	
	Total . . 47 lbs.	0 05	1 50	1 50
December 31 to January 30	Roots, 40 lbs	0 04	1 20	
	Hay, 2 lbs	0 00⅘	0 24	
	Straw, 5 lbs	0 00⅕	0 06	
	Total.... 47 lbs.	0 05	1 50	1 50
January 30 to March 1	Roots, 40 lbs	0 04	1 20	
	Hay, 5 lbs	0 02	0 60	
	Total.... 45 lbs.	0 06	1 80	1 80
March 1 to March 31	Roots, 40 lbs	0 04	1 20	
	Hay, 5 lbs	0 02	0 60	
	Total.... 45 lbs.	0 06	1 80	1 80
March 31 to April 30	Roots, 30 lbs	0 03	0 90	
	Hay, 8 lbs	0 03⅗	1 08	
	Total.... 38 lbs.	0 06⅗	1 98	1 98

EXPERIMENT I.—LOT II.—*Concluded.*

Period.	Daily Ration.	Daily Cost.	Cost for Period.	Total.
		$ cts.	$ cts.	$ cts.
April 30 to May 30	Roots, 30 lbs	0 03	0 90	
	Hay, 10 lbs	0 04	1 20	
				2 10
May 30 to November 1	At pasture @ $3 per steer			3 00
November 1 to December 1	Roots, 60 lbs	0 06	1 80	
	Hay, 8 lbs	0 03⅕	1 08	
	Meal, 3 lbs	0 04	1 20	
	Total .... 71 lbs.	0 13⅕	4 08	4 08
Cost of feed for 1 steer 365 days				17 76

SUMMARY OF EXPERIMENT I.—LIMITED GROWING RATION.

Continued from December 1, 1902.—Lot 11.

		Lbs.
Weight at start, December 1, 1902, 5 steers		3,487
Weight at finish, December 1, 1903, 5 steers		5,160
Gain for period		1,675
Daily rate of gain per steer	lbs.	·86
Cost of feed per day per steer (winter)	cts.	7
Cost of feed per day per steer (summer)	"	1·50
Cost of feed per day per steer for period	"	4·87
Cost of 1 lb. gain	"	5·30
Cost of feed for lot 1 year		$88 80

STEER-CALF EXPERIMENT.—EXPERIMENT II.

(Continued from December 1, 1902.)

The following tables show results to December 1, 1903.—

FULL FATTENING RATION.—EXPERIMENT II.—CONTINUED FROM DECEMBER 1, 1902.
LOT I.

Period.	Weight at Start.	Weight at Finish.	Gain.
1902.	Lbs.	Lbs.	Lbs.
December 1 to December 31	2,580	2,800	220
1903.			
December 31 to January 30	2,800	3,010	210
January 30 to March 1	3,010	3,200	190
March 1 to March 31	3,200	3,450	250
March 31 to April 30	3,450	3,600	150
April 30 to May 30	3,600	3,800	200
May 30 to June 30	3,800	4,100	300
June 30 to July 30	4,100	4,295	195
July 30 to August 30	4,295	4,410	115
August 30 to September 30	4,410	4,700	290
September 30 to October 30	4,700	4,980	280
October 30 to December 1	4,980	5,220	240

Total gain five steers for one year 2,640

FULL FATTENING RATION.—EXPERIMENT II—CON. LOT I.

Period.	Daily Ration.	Daily Cost.	Cost for Period.	Total.
		$ cts.	$ cts.	$ cts.
Dec. 1 to Dec. 31........	Roots, 15 lbs	0 01½	0 45	
	Meal, 2 lbs........................	0 02⅖	0 72	
	Hay, 2½ lbs........................	0 01	0 30	1 47
Dec. 31 to Jan. 30.......	Roots, 20 lbs	0 02	0 60	
	Meal, 2 lbs........................	0 02⅖	0 72	
	Hay, 2½ lbs........................	0 01	0 30	1 62
Jan. 30 to Mar. 1... ...	Roots, 25 lbs	0 02½	0 75	
	Meal, 3 lbs........................	0 04	1 20	
	Hay, 2½ lbs........................	0 01	0 30	2 25
Mar. 1 to Mar. 31.......	Roots, 25 lbs	0 03	0 90	
	Meal, 3 lbs........................	0 04	1 20	
	Hay, 2½ lbs........................	0 01	0 30	2 40
Mar. 31 to April 30	Roots, 30 lbs........................	0 03	0 90	
	Meal, 3 lbs........................	0 04	1 20	
	Hay, 4 lbs........................	0 01⅗	0 48	2 58
April 30 to May 30......	Roots, 30 lbs	0 03	0 90	
	Meal, 3 lbs........................	0 04	1 20	
	Hay, 4 lbs........................	0 01⅗	0 48	2 58
May 30 to June 30	Roots, 30 lbs	0 03	0 90	
	Meal, 3 lbs........................	0 04	1 20	
	Hay, 5 lbs........................	0 02	0 60	2 70
June 30 to July 30	Green feed, 40 lbs........................	0 04	1 20	
	Meal, 2 lbs........................	0 02⅖	0 72	1 92
July 30 to Aug. 28......	Green feed, 40 lbs	0 04	1 20	
	Meal, 2 lbs........................	0 02⅖	0 72	1 92
Aug. 28 to Oct. 1	Green feed, 40 lbs........................	0 04	1 36	
	Meal, 3 lbs........................	0 04	1 36	2 72
Oct. 1 to Nov. 1.........	Roots and G. F., 40 lbs........................	0 04	1 20	
	Meal, 3 lbs........................	0 04	1 20	2 40
Nov. 1 to Dec. 1	Roots, 40 lbs	0 04	1 20	
	Meal, 3 lbs........................	0 04	1 20	
	Hay, 5 lbs........................	0 02	0 60	3 00
	Cost to feed 1 steer, 1 year.........	....	....	27 56

SUMMARY, FULL FATTENING RATION, EXPERIMENT II. LOT I.

		Lbs.
Weight at start, December 1, 1902..................		2,580
Weight at finish, December 1, 1903..................		5,220
Total gain for period..................		2,640
Daily rate of gain per steer..................	lbs.	1·44
Cost of feed per day per steer..................	cts.	7·55
Cost of 1 lb. gain..................	"	5·21
Cost of feed for lot 1 year..................		$137 80

LOT II.—EXPERIMENT II.—CALVES OF 1902.—LIMITED GROWING RATION.—CONTINUED FROM DECEMBER 1902.

Period	Weight at Start.	Weight at Finish.	Gain.
	Lbs.	Lbs.	Lbs.
December 1 to December 31	1,945	2,150	205
December 31 to January 30	2,150	2,420	270
January 30 to March 1	2,420	2,725	305
March 1 to March 31	2,725	2,975	250
March 31 to April 30	2,975	3,195	220
April 30 to May 30	3,195	3,300	105
May 30 to November 1	3,300	3,480	180
November 1 to December 1	3,480	3,690	210
Gain of lot for year			1,745

LOT II.—LIMITED GROWING RATION.

Period.	Daily Rations.	Daily Cost.	Cost for Period.	Total.
		$ cts.	$ cts.	$ cts.
December 1 to 31	Roots, 15 lbs.	0 01½	0 45	
	Meal, 1 lb.	0 01⅕	0 36	
	Straw, 2½ lbs	0 00½	0 15	
				0 96
" 31 to Jan. 30	Roots, 20 lbs.	0 02	0 60	
	Meal, 1 lb.	0 01⅕	0 36	
	Straw, 2½ lbs	0 00½	0 15	
				1 11
January 30 to March 1	Roots, 25 lbs.	0 02½	0 75	
	Meal, 1 lb.	0 01⅕	0 36	
	Hay, 2½ lbs	0 01	0 30	
				1 41
March 1 to March 31	Roots, 30 lbs.	0 03	0 90	
	Meal, 1 lb.	0 01⅕	0 36	
	Hay, 2½ lbs	0 01	0 30	
				1 56
" 31 to April 30	Roots, 30 lbs.	0 03	0 90	
	Meal, 1 lb.	0 01⅕	0 36	
	Hay, 2½ lbs	0 01	0 30	
				1 56
April 30 to May 30	Roots, 30 lbs.	0 03	0 90	
	Hay, 4 lbs	0 01⅗	0 48	
				1 38
May 30 to November 1	Pasture at $3 per steer			3 00
November 1 to Dec. 1	Roots, 40 lbs.	0 04	1 20	
	Hay, 2 lbs	0 00⅘	0 24	
	Straw, 5 lbs.	0 01	0 30	
				1 74
Total				12 72

SUMMARY.

	Lbs.
Weight at start, December 1, 1902	1,945
Weight at finish, December 1, 1903	3,690
Total gain for period	1,745

Daily rate of gain per steer	lbs.	·95
Cost of feed per day per steer (winter)	cts.	4·52
Cost of feed per steer (summer)	"	1·50
Cost of feed per day per steer for period		$ 3 48
Cost of 1 lb. gain	cts.	3·64
Cost of feed for lot, 1 year		$63 60

PIGS.

The herd of pigs on the farm consists of Yorkshires, Berkshires, and their grades and crosses, in all 60 head, as follows:—

1 Yorkshire boar, registered.

4 Yorkshire sows, registered.

1 Berkshire boar, registered.

2 Berkshire sows, registered.

6 grade brood sows.

46 grade pigs, from 1 to 6 months' old.

EXPERIMENTS WITH SWINE.

FEEDING IN PASTURE COMPARED WITH FEEDING IN PENS.

The experiment carried on in the summer of 1902, was repeated this year with 20 pigs of from 1 to 2 months old, in 2 lots of 10 each, of various breeds and crosses, each lot consisting of an equal number from each litter and termed lot 1 and lot 11:— lot 1 in pasture and lot 11 in pens.

They were fed an average ration of 2 lbs. buckwheat meal, shorts and wheat-bran, and 3 lbs. skim-milk, from July 1 to November 1, and pasture, which consisted of 1 acre of equal parts of rape, hairy or sand vetch, and spring vetch and peas mixed, sown side by side lengthwise of the field, and divided with hurdles crosswise of the field into six divisions.

The pigs were moved from division to division once every week. A portable house was used for shelter.

On November 1 the pigs were taken into pens, and fed a ration of 3 lbs. per day of a mixture of shorts, corn-meal and wheat-meal, until December 1.

The results are as follows;

EXPERIMENTS WITH SWINE.—EXPERIMENT I.—LOT I.

FED ON PASTURE, JULY 1 TO NOVEMBER 1; FED IN PENS, NOVEMBER 1 TO DECEMBER 1.

Number.	Breed.	Weight, July 1.	Weight, November 1.	Weight, December 1.	Days Fed.	Gained.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
1	Yorkshire..........	35	172	233	153	198
2	" (D) Berkshire (S)........	30	158	198	153	168
3	" (D) Tamworth (S)......	24	137	184	153	160
4	Berkshire (D) Yorkshire (S)......	29	148	192	153	163
5	Chester (grade)	27	120	160	153	133
6	Yorkshire......................	34	191	243	153	209
7	" (D) Berkshire (S).......	31	151	192	153	161
8	" (D) Tamworth (S).......	30	115	157	153	127
9	Berkshire (D) Yorkshire (S).......	24	118	184	153	160
10	Chester (grade)	21	139	175	153	154

LOT II.—FED IN PENS, JULY 1 TO DECEMBER 1.

Number.	Breed.	Weight, July 1.	Weight, November 1.	Weight, December 1.	Days Fed.	Gained.
1	Yorkshire......................	32	152	178	153	146
2	" (D) Berkshire (S)......	30	140	161	153	131
3	" (D) Tamworth (S). . . .	26	119	146	153	120
4	Berkshire (D) Yorkshire (S)......	28	122	153	153	125
5	Chester (grade)...........	22	86	118	153	96
6	Yorkshire......................	31	129	157	153	126
7	" (D) Berkshire (S).......	24	128	152	153	128
8	" (D) Tamworth (S).......	27	108	138	153	111
9	Berkshire (D) Yorkshire (S)......	26	116	144	153	118
10	Chester (grade)..................	18	102	141	153	123

	Lbs.
Lot 1—average daily gain on pasture, July 1 to Nov. 1......	·95
" " in pens, Nov. 1 to Dec. 1........	1·51
" " entire period....	1·06
Cost per lb. gain entire period, exclusive of pasture....	3·04c.

	Lbs.
Lot 11—average daily gain in pens, July 1 to Nov. 1........	·76
" " Nov. 1 to Dec. 1....	·92
" " entire period	·80
Cost per lb. gain entire period....	4·05c.

SHEEP.

The flock of sheep at present consists of:—

1 pure bred Leicester ram.

5 pure bred Leicester ewes.

5 pure bred Shropshire ewes.

4 grade Shropshire ewes.

2 cross bred Leicester-Shropshire ewe lambs.

POULTRY.

During the year four breeds of poultry were kept: B. P. Rocks, Black Minorcas, White Leghorns and Buff Wyandottes.

Two additional breeds were the number added this year, and now on hand is six. Barred P. Rocks, Black Minorcas, White Leghorns, Buff Wyandottes, White Wyandottes and Silver Grey Dorkings.

The breeding pens were made up as follows:—

	Hens.	Cocks.
B. P. Rocks	4	1
Black Minorcas	3	1
W. Leghorns	4	1
Buff Wyandottes	3	1

The season's chicks were all hatched by incubator, the incubator being filled 5 times.

During the winter season they were fed on corn-meal, shorts and crushed oats mashed in the morning, and whole grain in the afternoon. Green-bones, meat-scraps and oyster shells were regularly given and free access to water and dust bath.

The eggs laid during the year by the different breeds were as follows:—

Variety.	Eggs laid.	Av. per hen.
4. B. P. Rocks	260	65
4. W. Leghorns	340	85
3. B. Minorcas	160	53
3. Buff Wyandottes	250	83

In past years they were only allowed a run out part of the time as they were quite destructive to flowers and shrubs that grew close to their buildings, and as a consequence had to be kept in small yards the greater part of the summer.

This summer a yard of about ½ acre in extent was fenced off close to their building, which will serve as a run for the future, thus improving the conditions under which they have been kept.

BEES.

Six colonies were put into winter quarters last December; all died through the winter.

EXPERIMENTS TO TEST THE VALUE OF BUG DEATH AS COMPARED WITH PARIS GREEN AND BORDEAUX AND PARIS GREEN ON POTATOES.

The object of this experiment was to test the value of Bug Death as an insecticide as compared with Paris green, and also as an insecticide and fungicide as compared with bordeaux mixture and Paris green.

For this experiment a piece of ground was chosen adjoining the potato plots. The land was similar in character and had the same treatment. It was divided into three plots, each one-twentieth of an acre. The variety of potato used was the Delaware, and the plots were all planted May 22 and dug September 23. The vines were sprayed or dusted three times, July 21, August 4 and August 28.

Plot A.—Paris green, ½ lb., 1 gallon lime water, and water added to make 40 gallons. This was sprayed on the plants twice only, as no bugs were present after the second application.. For the first application 6¾ gallons were used; for the second 7½ gallons were used, making a total of 14½ gallons per plot of one-twentieth acre, or 290 gallons per acre for both applications, the mixture containing for the acre 3 lbs. 10 oz. of Paris green.

Plot B.—Bug Death dry was dusted on the leaves with a cheese cloth dusting bag. The vines were nicely covered, but not given an excessive amount. For the first application 4½ lbs. of Bug Death was used per plot; for the second, 5 lbs. per plot, and for the third, 4¾ lbs. per plot, making a total of 14¼ lbs. per plot, or 285 lbs. per acre in the three applications.

Plot C.—Bordeaux and Paris green mixture, made as follows:—Bluestone, 4 lbs.; lime, 4 lbs.; Paris green, ½ lb., and water added to make 40 gallons. For the first application seven gallons of the mixture was used, second application 8 gallons per plot, and third application 7½ gallons of Bordeaux alone, as it was not considered necessary to add Paris green, no bugs being present. This made a total of 22½ gallons to the plot of one-twentieth acre at three applications, or equal to 450 gallons of the mixture to the acre, for which 45 lbs. of bluestone, 45 lbs. lime and 3¾ lbs. of Paris green would be used.

MATERIAL USED AND COST PER ACRE.

Plot A.—3 lbs. 10 oz. Paris green at 20c. per lb.	$ 0 72½
Plot B.—285 lbs. Bug Death at $7 per hundred	$19 95
Plot C.—45 lbs. bluestone at 7c. per lb.	$ 3 15
45 " rock lime at 1c.	0 45
3¾ " Paris green at 20c.	0 75
	$ 4 35

For killing bugs alone two applications of either Paris green or Bug Death are sufficient. Therefore, the cost of Plot A, as compared with Plot B per acre, is as follows:—

Plot A.—3 lbs. 10 oz. Paris green at 20c.	$ 0 72½
" B.—190 lbs. Bug Death at 7c.	13 30

There was no blight on any of these plots. The following yields per acre were obtained.

How Treated.

	Bus.	Lbs.
Plot B.—Bug Death	373	20
" C.—Bordeaux and Paris green	310	..
" A.—Paris green	290	20

METEOROLOGICAL RECORD.

The maximum and minimum thermometrical observations for the year beginning December 1, 1902, and ending November 30, 1903 :—

Month,	Maximum.	Minimum.
1902.		
December	22nd 52° above zero	10th 16° below zero
1903.		
January	21st and 27th 41° above zero	19th 12° "
February	28th 50° above zero	18th and 20th 5° below zero
March	14th 53° "	3rd 2° above zero
April	29th 65° "	7th 13° "
May	28th 74° "	16th 22° "
June	10th 80° "	4th 28° "
July	11th 82° "	29th 40° "
August	20th 76° "	3rd 36° "
September	14th 80° "	10th 32° "
October	1st 69° "	31st 23° "
November	1st 4th 5th 57° above zero	21st 11° "

RAINFALL.

April	3·57	inches.
May	·68	"
June	2·29	"
July	2·07	"
August	2·40	"
September	3·63	"
October	5·78	"
November	7·98	"
Total	28:40	"

I have the honour to be. sir,
your obedient servant,

R. ROBERTSON,
Superintendent.

REPORT OF THE HORTICULTURIST.

(W. S. BLAIR.)

NAPPAN, N.S., December 1, 1903.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit hereith a report of some of the work done in the horticultural department of the Experimental Farm for the maritime provinces for the year 1903.

The spring generally was very favourable for getting work done, on account of more than usual dry weather. The mean average temperature for May was about equal to that of other years. June was not as warm as usual. July was about up to the average temperature, while August was considerably cooler. This made it unfavourable for plants that require plenty of heat to develop properly. The following table gives the mean average temperature for the months of May, June, July, August and September, as compared with those months of the years 1900-1901 and 1902:—

Month.	Mean Temperature at Nappan.				Rainfall, 1903.
	1903.	1902.	1901.	1900.	
	°	°	°	°	Inches.
May	47·7	47·6	48·1	46·1	0·68
June	53·6	54·5	59·3	57	2·29
July	62·7	61·7	65·2	64·5	2·07
August	59·3	63·4	65·3	62·1	2·40
September	57·5	57·5	58·4	53·4	3·63

The exceptionally dry weather in May and to the latter part of June caused a slow and uneven germination of garden seeds. In some cases where there was not sufficient moisture to start them they remained dormant for several weeks. The dry weather was exceptionally trying to annual flowering plants; both those started from seed in the open ground and transplanted plants. There were frosts in June on the 1st, 2nd, 4th and 5th, doing considerable damage. Frost kept off unusually well in the fall, the first being on October 4 of 6°.

The apple crop here was about up to the average, and of excellent quality. The apple crop in the Annapolis and Cornwallis valleys and western end of the province was a good one. The apple spot was not so prevalent as usual, the season not favouring its development. The fruit developed well, and the percentage of inferior fruit is small. The fruit crop in the eastern end of the province is small. Prince Edward Island reports would indicate that on the average not one-third of a fair crop was gathered. New Brunswick reports a good crop of apples of excellent quality.

In plums we have to report a complete failure, due to the late frosts killing the blossoms. The report is an average crop in the Annapolis and Cornwallis valleys. Prince Edward Island reports that on the average one-half of a good yield was harvested.

Cherries here all suffered from late frosts. The frost and birds together have made it difficult to obtain a quart of ripe cherries the past three years. The pear crop was also a failure this year.

Strawberries, owing to the extremely dry weather, gave only one-half an average crop. A considerable shortage in this crop is also reported from all over the maritime provinces. The gooseberries, raspberries and currants were only a fair crop. Cranberries are reported one-third of a fair yield, due to the injury of blossoms from the late frosts.

The fruit trees have made a fair growth this season. The shrubs and ornamental trees made an average growth. An addition was made this season to the area devoted to ornamental trees and shrubs and many new varieties sent from the Central Farm at Ottawa were planted, all of which did well.

The collection of annuals and perennials are each year a source of much pleasure and profit to visitors. In this report I am presenting some of the information obtained from the annuals tested here during the past four years. I am also reporting the growth of hedges under test here. Experiments were again conducted with different varieties of vegetables, some of which are included in this report.

I beg to acknowledge the following donations: From John Byrne, Esq., Kentville, N.S., scions of 'Cornish Aromatic' apple. From Mr. A. S. Banks, Waterville, N.S., scions of 'Black Ben Davis,' and 'Apple of Commerce.' From Mr. Wm. Sangster, Falmouth, N.S., two trees of 'Stark' apples. From Stark Bros., Louisiana, Mo., ten varieties of peach trees.

I addressed several agricultural meetings in Nova Scotia and New Brunswick during the year; also a series of two weeks' institute meetings in Prince Edward Island, from February 17 until March 3.

HEDGES.

In the spring of 1896 twenty-three different kinds of hedges were planted. The plants were from 6 to 8 inches high, and were set 18 inches apart, in rows 50 feet long, The hedges were placed ten feet apart, and have been trimmed more or less every year. This is done once about the last of June to head in rank growing shoots, but the principal clipping is done the last of July or early in August.

The system of clipping adopted here with deciduous hedges is to produce rounded top and sides, and this has given satisfactory results. Where the sides are clipped square with almost a square top, as is sometimes seen, hedges so treated usually have many dead bottom branches.

In pruning the evergreen hedges, the aim is to give a gradual rounding from the top to the ground, giving the tips of all branches access to sunlight and rainfall, which doubtless aids their proper development, and in this way well grown vigorous branches to the bottom are usually obtained. Severe clipping when the hedges are young is not necessary, but some trimming should be done every year.

Sometimes hedges are planted with two rows, 8 or or 10 inches apart. This does not appear to be necessary, as one row of plants 18 inches apart will give excellent results. Plants not more than 18 inches high, well branched to the bottom, are the best. The common spruce makes one of the best and most easily obtained hedges, and no prettier hedge can be had if kept in proper shape. The Amur Privet, *Ligustrum amurense,* is one of the best of the deciduous hedges tested here. The Ginnalian maple is a stronger and quicker growing hedge; but it requires more clipping to keep it in shape.

EVERGREEN HEDGES.

Name of Variety.	Present height of hedge.	Present width of hedge at bottom.	Character of Hedge.
	Feet.	Feet.	
Thuya occidentalis, common Arbor vitæ or White Cedar	2½	3¼	Good.
Picea nigra, Common Black Spruce	2¾	3	"
Picea excelsa, Norway Spruce	3½	4	"
Picea pungens, Rocky Mountain Blue Spruce	2½	2¾	"
Pinus Cembra, Swiss Stone Pine	2¾	2½	Fair.
Pseudotsuga Douglasii, Douglas Fir	3½	3¼	Good.

DECIDUOUS HEDGES.

Ligustrum amurense, Amur Privet	3¾	5½	Good.
Rhamnus cathartica, Common Buckthorn	3¼	4	"
Acer tataricum Ginnala, Ginnalian Maple	5¼	6	"
Acer glabrum, Smooth Western Maple	3	3	Very poor.
Cotoneaster acutifolia, Sharp-leaved Cotoneaster	3	3¼	Fair.
Cotoneaster integerrima, Common Cotoneaster	2½	3½	"
Berberis Thunbergii, Thunberg's Barberry	2¾	4	Good.
Rosa rubrifolia, Purple-leaved Rose	4¾	3	Very poor.
Berberis Vulgaris purpurea, Purple-leaved Barberry	2¾	2¾	Fair.
Lonicera tatarica, Tartarian Honeysuckle	4	4	"
Caragana arborescens, Siberian Pea tree	3	3	"
Caragana frutesens, Woody Caragana	2½	2¼	"
Viburnum Lantana, Wayfaring Tree	2¾	2¾	"
Syringa vulgaris, Charles X. seedling lilac	4	3½	"
Spiræa Van Houttei, Van Houtte's Spiræa	3	3½	"
Neillia opulifolia aurea, Golden-leaved Nine bark	3½	4	"
Neillia opulifolia, Nine Bark	4¾	5¼	"

ANNUAL FLOWERING PLANTS.

The object in growing a number of annual flowering plants is to beautify the grounds, and to obtain information as to their relative value for bedding, massing, or mixed planting. Some bedding work is done, but the majority of the flowers are grown in masses in beds, 3 by 12 feet. These are easily kept weeded, and one-half of each bed is usually given to a variety. The plants grown are generally of mixed colours, and little attention has thus far been devoted to varieties in special colours. The mixed will be found to give general satisfaction, and the best strains obtainable of the different kinds are used.

A large number of annuals will start easily in the open ground, but for early bloom those grown in the hot-bed and once transplanted there to develop stocky, well rooted plants, will be found the most satisfactory. The difficulty in sowing the seed in the open ground is to get the young plants started early enough. The seed generally is sown shallow, and a few dry days will thoroughly dry out the surface soil. In some instances careful and frequent watering is needed; very dry weather is also unfavourable for transplanting. This year strawberry boxes were used to shade the plants for a few days until they were rooted. The show of flowers was good this season, and the selection an excellent one, containing many new and interesting things.

LIST OF ANNUAL FLOWERS GROWN AT NAPPAN.

Propagated in hot-beds, grown March 15: transplanted into shallow boxes about April 15 and put out in open ground May 15.

Asters (12 varieties)—Flowered profusely and made an excellent display.

Ageratum coyzoides.—Made a nice show with its brush-like blue flowers.

Amarantus superbus.—Gave excellent results.

Brachycoma iberidifolia,—A graceful plant; fine for edging, flowered abundantly,

Chrysanthemum coronarium, Chrysanthemum carinatum tricolor, Chrysanthemum aureum.—These all flower freely and are very attractive. *C. aureum* is an excellent border plant.

Celosia plumosa, Celosia plumosa superba, Celosia plumosa (dwarf).—All good varieties; flowered freely; very useful for bedding.

Dianthus chinensis, Dianthus Heddewiggii, Dianthus laciniatus, Dianthus diadematus, Dianthus imperalis.—All good sorts; produce flowers in great variety of form and colour in great abundance. In bloom from early in August to frost.

Gaillardia picta, Gaillardia picta Lorenziana.—Produce brilliant flowers in great abundance.

Lobelia erinus (Crystal Palace).—Valuable for bedding and edging.

Antirrhinum majus, Antirrhinum majus manum, Antirrhinum (Tom Thumb).—Beautiful free flowering varieties of Snapdragon.

Nicotiana affinis, Nicotiana colossea, Nicotiana sylvestris.—Free blooming and effective, especially in large beds.

Phlox Drummondii (many varieties).—Excellent for bedding; free bloomers with a wide range of attractive colours.

Petunias (many sorts, single and double).—Very showy flowers, abundant bloomers, useful for bedding.

Portulaca grandiflora.—Produces brilliant flowers in great abundance.

Pansies (many varieties.)—Flower most freely, make an excellent display.

Stocks (many varieties).—Give fine flowers; useful for bedding.

Verbenas (in great variety).—Profuse bloomers, very pretty.

Zinnias.—Showy annuals; flowers purple and orange.

LIST OF ANNUAL FLOWERS GROWN AT NAPPAN.

SOWN IN THE OPEN GROUND ABOUT MAY 15.

China Asters, 12 varieties.—Made a fine show in the autumn.

Abronia umbellata.—In bloom August 6. A handsome trailing plant.

Agrostemma cœli rosea—In bloom last of July. Bloomed well.

Amarantus superbus.—Flowered freely in the autumn.

Alyssum Little Gem.—Succeeds well; a fine border plant.

Bartonia aurea.—In bloom July 18 to September 8; made a fine show.

Cacalia coccinea.—Produces scarlet flowers in abundance.

Cacalia lutea.—An orange flowered sort; very desirable.

Calendula officinalis (Royal Trianon.).—In bloom July 24; flowers very fine and abundant.

Coreopsis tinctoria, Coreopsis Drummondii, Coreopsis Atkinsoniana.—Very showy. Flowers bright yellow; produced in abundance from last of July to frost.

Iberis coronaria, Iberis odorata, Iberis umbellata.—Plants useful for bedding; bloom freely from July 18 until frost.

Centaurea cyanus, Centaurea moschata, Centaurea alba.—All bloom well from July 18 until late in autumn. Make a fine display.

Godetia rubicunda splendens, Godetia Whitneyi.—Produce showy flowers of a satin-like texture, beginning July 20.

Eschscholtzia californica, Eschscholtzia mandarin, Eschscholtzia Douglasi.—Known as California Poppies; remarkable for the abundance and brilliance of their flowers.

Gypsophila elegans, Gypsophila elegans rosea.—Produces small flowers in abundance, valuable for bouquets.

Helichrysum bracteatum.—Everlasting flowers; very desirable.

Helianthus multiflorus fl. pl., Helianthus cucumeri folius Stella.—Produce showy bright yellow flowers in abundance.

Larkspur hyacinth-flowered, Larkspur ranunculus-flowered, Larkspur candelabrum, Larkspur Emperor.—These different forms of larkspur are all desirable. They vary in height and colour, but are free bloomers and very ornamental.

Lupinus sulphureus, Lupinus hybridus fl. pl. Lupinus nanus fl. albus, Lupinus nanus albo coccinea.—Different forms of Lupin, producing in August large spikes of flowers of different colours.

Nigella damascena.—Produces interesting and attractive flowers..

Papaver somniferum, Papaver Rhoeas, Papaver carnation-flowered, French Shirley.—All desirable forms of Poppy; very free bloomers, with a wide range of colours.

Scabious major, Scabious major dwf.—Produce flowers in great abundance.

Salpiglossis var. grandiflora, Salpiglossis var. superbissimus.—Both very fine varieties and free bloomers.

Tagetes signata pumila.—A very fine bloomer, good for massing.

GARDEN VEGETABLES.

EXPERIMENTS WITH GARDEN PEASE.

Comparative tests have been carried on for a number of years with varieties of garden peas obtained from different seedsmen. This season eighty-two sorts were under test including many of the newer sorts advertised. The information obtained from these tests has been reported from time to time, and varieties considered of less value than others have been discarded. This season fifty sorts have been thought not worthy of further test, and a table of those kinds found to be the best is given below.

The seed was sown in rows 3 feet apart, and 33 feet long. No stakes or brush was used as support to the vines, they being allowed to spread between the rows. Two rows, each 33 feet long, were planted of each variety—one row was allowed to ripen for seed, and the other was picked when fit for eating green, and the weight of unshelled pods fit for market obtained. The seed was sown May 4, in drills 2 inches deep, 1½ inches apart.

The ground was previously in corn, having been manured for that crop in the spring of 1902. Complete commercial fertilizer, at the rate of 100 lbs. per acre, was scattered along the rows at time of planting. The land was well worked up before seeding, and the rows were kept cultivated and hoed until the first of July, after which on account of the vines covering the ground it could not be worked.

Peas can be grown in almost any kind of soil, but for the best results a fairly rich loam should be selected. The pea plant likes a cool moist soil, and can be planted as early in the spring as the land is fit to work. No gain, however, is made by planting on ground that has been worked before it is dry enough.

The wrinkled sorts of peas are generally better in quality than the smooth, round kinds, but the majority of very early peas put upon the market are of the latter character. The Alaska, or green smooth pea, and Station, a green wrinkled variety, are the two best very early peas to grow. They are as early and as good croppers as any of the

very early sorts tested. They are not large podded, as, in fact, none of the very early sorts are. Following these as market sorts are, Prosperity, or Gradus, Thomas Saxton and King Edward VII., all about the same class and coming in at the same time. These are practically of the same season as Nott's Excelsior and American Wonder, but have much larger pods. We could not see any difference between Thomas Saxton and King Edward VII. pea. These varieties can be safely recommended for either home use or market purposes, surpassing in vigor and productiveness either the Gradus or Prosperity, and if anything a little earlier.

GARDEN PEASE.

Name of Variety.	When First Fit to Use.	Date of Last Picking.	Length of Vine.	Length of Pods.	Number of Peas in Pod.	Size of Pea.	Kind of Pea.	Total weight of marketable peas in pod.
			in.	in.				lbs.
Alaska	July 15	July 30	36	2½ to 3	6 to 7	Small	Smooth	28
Station	" 15	" 30	38	2¾ " 3	6 " 7	"	Wrinkled	28
Surprise	" 15	" 30	37	2⅓ " 3	6 " 7	"	"	23
First of All	" 15	" 30	40	2½ " 3	6 " 7	"	Smooth	21
Claudit	" 21	Aug. 4	42	3 " 3½	6 " 8	Medium	"	21½
Exonian	" 21	" 4	42	2¾ " 3	6 " 7	"	Wrinkled	26
Ameer	" 21	" 4	37	3 " 3½	6 " 8	Large	Smooth	19¾
Prosperity	" 21	" 6	43	3½ " 4	6 " 8	"	Wrinkled	25½
Thos. Saxton	" 21	" 4	47	3¼ " 4	6 " 8	"	"	32¼
King Edward VII	" 21	" 4	47	3¼ " 4	6 " 8	"	"	31¼
Gradus	" 21	" 6	43	3½ " 4	6 " 8	"	"	22½
A 1	" 21	" 6	42	3¼ " 3¾	6 " 7	"	"	23½
American Wonder	" 21	" 6	28	2¾ " 3	5 " 7	Medium	"	23½
Nott's Excelsior	" 21	" 6	22	2½ " 2¾	5 " 7	"	"	23½
Juno	Aug. 3	" 13	30	3½ " 4	7 " 8	Large	"	27½
Hurst's Reliance	" 3	" 8	46	3 " 3¼	5 " 7	"	"	30¼
Dwarf Defiance	" 3	" 8	20	3½ " 4½	7 " 9	"	"	25½
Advancer	" 3	" 13	48	2¾ " 3	6 " 7	Medium	"	32
Daisy	" 3	" 13	20	3¼ " 4	6 " 8	Large	"	35½
Prolific	" 3	" 13	36	3½ " 4½	7 " 9	"	"	37
Admiral Dewey	" 3	" 13	40	3½ " 4½	7 " 9	"	"	40¼
American Champion	" 3	" 13	54	3½ " 4	7 " 8	"	"	27½
Prince Edward	" 3	" 13	54	3¾ " 4¾	7 " 9	"	"	27½
Dwarf Telephone	" 3	" 18	24	3 " 3½	6 " 8	"	"	26½
Prodigious	" 10	" 18	52	3¾ " 4½	7 " 9	"	"	39½
Fillbasket	" 10	" 25	48	3¾ " 4½	7 " 9	"	"	33¼
Perfection	" 10	" 28	52	3½ " 4½	7 " 9	"	"	22½
Heroine	" 10	" 20	53	3¾ " 4½	7 " 9	"	"	39¾
Duke of Albany	" 10	" 25	50	3 " 3¾	6 " 7	"	"	39¾
Stratagem	" 10	" 25	49	3 " 3¾	7 " 8	"	"	34
Stanley	" 10	" 25	52	4 " 4½	7 " 9	"	"	26¾
Perpetual	" 10	" 30	49	3 " 3¾	5 " 7	"	"	38

EXPERIMENTS WITH TOMATOES.

Seventy-one varieties were included in this comparative test. The seed was sown April 7, in boxes 3 inches deep with 2½ inches of soil. These boxes were set on a hot-bed having a moderate heat. The plants did not make a rapid growth, but strong, vigorous plants were ready for pricking out; one plant in a strawberry box filled with fairly rich garden soil, on April 27. These boxes were set closely together in a hot-bed having moderate heat, and having about 2 inches of sand over the manure.

These plants were carefully watched, giving a judicious amount of water, and allowing plenty of ventilation on warm days. The boxes were moved in the hot-bed once a week to prevent the roots of the plants from fastening on the manure below the boxes, for the roots will quickly penetrate into it through the openings in the boxes.

ORCHARD PROTECTED BY NATURAL SHELTER BELT OF SPRUCE TREES. THE APPLE TREES WERE PLANTED IN 1897.

It is not well to force the plants too much in the hot-bed, but a moderate, continuous growth is important. To be the most successful, this character of growth should be maintained if practicable, without check from the time the plants are started until the fruit is ripe. Before planting out, the sash was left off the plants as much as possible, this making them hardy and more stocky. The tomato requires a uniformity of heat and moisture to develop properly. There is usually no gain in setting the plants in the open ground before towards the middle of June. This year, however, the soil was fairly warm, and weather conditions favourable, and they were put out June 10. The boxes were cut, and the plants set with the earth attached. They were set on the level and not mounded up.

Usually it is not necessary to water the plants when they are planted this way, but this season a drying wind with exceptionally dry soil made it necessary to water once. This was done by making the soil cup-shaped around the plant to hold the water, and pouring about a quart around each plant. After the water had been soaked up well, dry earth was put around each plant to conserve the moisture by preventing evaporation. Out of the 400 plants set none were lost. Although the season kept dry it was not found necessary to water again.

The practice followed by some of keeping the soil around the plants soaked with water, is not good, as an excess of water and lack of heat checks the growth of the plants very materially.

The plants when set were from 8 to 10 inches high, and some of them were in blossom. A lath was driven into the ground by each plant, to which it was tied. The lateral branches were kept cut off as they appeared, and the plant trained to the stake, allowing only one stalk to grow. Each plant was tied to the stake three times as they grew, and each plant was about 4 feet high at the end of the season.

This method gives more perfect fruit which ripens earlier than where the plants are allowed to run untrained over the ground; but, the yield of fruit is not so large. Five plants of six varieties were allowed to grow without stakes to compare with five similar plants of the same variety staked. Those trained were not affected with rot nearly so much as those not staked, and there was a much larger percentage of perfect marketable fruit. The unstaked plants require more room, and should be set 4 by 4 feet apart each way, while those staked can be set 30 inches apart each way.

The practice followed by some is to let the vines grow until about the first of August, when three stakes each about 3 feet long are set pyramid shape over the plant, and tied at the top. The vines are gathered together and tied with binder twine to the top of these stakes. This keeps the fruit from the ground and prevents so much dampness around the fruit, thereby materially lessening the loss of fruit from rot.

Sufficient cultivation and hoeing was given to keep the ground in a loose condition. The land had not been manured since the spring of 1901, and had tomatoes on it in 1902. The usual practice is to grow tomatoes where the previous crop has been manured, and not use stable manure directly for the crop, as it is apt to produce too rank a growth in the plant. The soil on which these plants were grown was a light clay loam, not very fertile, and potato fertilizer at the rate of 300 lbs. per acre was sown broadcast and harrowed before planting. In addition to this, one teaspoonful of nitrate of soda was scattered around each plant on June 26 before a rain, and a similar amount on July 14. This quantity of nitrate of soda will be found sufficient to give the plant a good start.

The object of the experiment was to find out which kinds are earliest maturing and best for market purpose. The requirement of the market is for an even, round fruit, not too small. The varieties found best were Sparks Earliana, a scarlet, medium-sized round, smooth tomato; Bond's Early Minnesota, a smooth purplish pink, medium-sized tomato; Early Ruby, medium, quite smooth, scarlet, and Extra Early Advance, medium, smooth, scarlet.

The season being short at best for tomatoes in the maritime provinces, earliness i of great importance. Any fruit that will mature at Nappan is likely to mature i almost any part of the maritime provinces, if given similar treatment.

Five plants of a variety were planted in each plot, and the following yield of ripe and green fruit was obtained. For fear of frost, all unpicked fruit was gathered September 21.

TOMATOES.

Name of Variety.	Sept. 4. Ripe Fruit from 5 Plants.	Sept 14. Ripe Fruit from 5 Plants.	Sept. 21. Ripe Fruit from 5 Plants.	Sept. 21. Green Fruit from 5 Plants.	Total Ripe Fruit from 5 Plants.	Total Green Fruit from 5 Plants.	Character of Fruit.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
Autocrat	3½	4	1½	5	9	14	Smooth.
Atlantic Prize	4	2¾	2½	6¼	9¼	15½	Medium smooth.
Acme	8¾	3½	4	10¼	16¾	27	Smooth.
Acme—Improved	5¾	11¾	¾	7¾	18¼	26	"
Brinton's Best	1½	3½	4	12½	9	21½	"
Bright and Early	2	4	1	7	7	14	"
Baltimore Prize Taker	1¾	3¼	4	11¼	9	20¼	"
Bolgiano's Best	½	2½	3	8¼	6	14¼	"
Best of All	½	4	2¾	15	7¼	22¼	"
Crimson Cushion	1¼	4	8	13	13¼	26¼	Medium smooth.
Century	3	3	5¼	11¾	11¼	23	Smooth.
Comrade	8¼	5¾	2½	13¼	11½	24¾	Medium smooth.
Combination	3¾	3	5	11¼	11¾	23	Smooth.
Climax	2¼	8½	3½	8	14¼	22¼	"
Canada	1½	2½	3¼	19¾	7¼	27	Medium smooth.
Cream City	2	5½	½	11	8	19	Smooth.
Democrat	1¼	3	2	6¼	6¼	12½	"
Dominion Day	3½	12¼	1½	8	17¼	25¼	Medium smooth.
Diadem	1¾	3½	3½	10½	8¾	19¼	Smooth.
Dwarf Champion	¾	2½	3	12¼	6¼	18½	"
Earliana	5½	4	2	12	11½	23½	"
Early Minnesota	1½	2¼	6	10	9¾	19¾	"
Extra Early Advance	6	13¾	1½	9¾	21¼	31	"
Enormous	....	4	2¼	8	6¼	14¼	Medium smooth.
Early Richmond	4¾	11½	5½	7	21¾	28¾	Rough.
Early Leader	8	2½	6	8½	16½	25	"
Early Jersey	4½	7½	3¾	12	15¾	27¾	"
Early Jewel	3	4	2	8½	9	17½	Smooth.
Early Ruby	4	4	9	14	17	31	Medium smooth.
Essex Hybrid	2¾	2½	2	8¾	7¼	16	"
Earliest-Maule	1¼	4½	1	16¾	6¾	23¼	"
Early Bermuda	2¼	5½	3	9	10¾	19¾	"
Favourite	4	2½	1¾	10¾	8¼	19	Smooth.
Frogmore	2¾	4½	3	16½	10¼	26¾	"
Fordhook First	2¾	6	1½	5½	10¼	15¾	"
Freedom	¾	4	½	9¼	5¼	15	Medium smooth.
Fordhook Fancy	1¾	2¼	3¼	7¾	7¼	15	Smooth.
Creekside Glory	2½	5½	5½	14¼	13½	27¾	Medium smooth.
Garden Sowing	1¾	2	1	11	4¾	15¾	Smooth.
Golden Jubilee	3¼	5½	3	15	11¾	26¾	Medium smooth.
Great Mississippi	4¾	7½	4½	9½	16¾	26¼	Medium smooth.
Honor Bright	1½	6½	3¾	8	11¾	19¾	Smooth.
Ignotum	1	3½	3¾	17¾	8¼	26	"
King Humbert	½	2	6	14	8½	22½	Medium smooth.
Long-keeper	4	5½	2	12	11½	23½	"
Lorillard	3¾	3	5	11¼	11¾	23	Smooth.
Landreth's Earliest	3	3¼	4½	6¼	10¾	17	Medium smooth.
Livingston's Stone	3½	2½	4½	13½	10½	24	Smooth.
Maule's—No name	....	4½	5¾	16¾	10¼	27	Medium smooth.
Marvel	1	5½	3	8¼	9½	17¾	Smooth.
Magnus	2¼	5½	1¼	6½	9	15½	Medium smooth.
Matchless	½	2¼	2	18	4¾	22¾	Smooth.

TOMATOES—*Concluded.*

Name of Variety.	Sept. 4. Ripe Fruit from 5 Plants.	Sept. 14. Ripe Fruit from 5 Plants.	Sept. 21. Ripe Fruit from 5 Plants.	Sept. 21. Green Fruit from 5 Plants.	Total Ripe Fruit from 5 Plants.	Total Green Fruit from 5 Plants.	Character of Fruit.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
New Imperial	2	2¾	2	16½	6¾	23¼	Smooth.
Nolte's Earliest	5	9¼	2	4	16¼	20¼	"
New Buckeye State	....	1¾	2½	12¾	4¼	16¾	"
New Liberty Bell	2	5	4¼	11	11¼	22¼	Medium smooth.
Plentiful	4	4½	2½	14	11	25	"
Ponderosa	2½	5	4½	11¼	12	23¼	"
Perfection	1¼	3	3	9½	7¼	16¾	Smooth.
Picture Rock	¾	4½	7	11½	12¼	23¾	"
Quick-sure	4	2¾	3	7¾	9¾	17½	"
Quarter Century	1¼	5½	2¾	5	19½	24½	"
Royal Red	5½	9¼	1½	5	16¼	21¼	"
South Jersey	7½	1½	4	7	13	20	Medium smooth.
Success	½	2	2¼	15¼	4¾	20	Smooth.
Spark's Earliana	8¾	3	1½	10	13¼	23¼	"
Simmer's Earliest	3¼	14¾	1	4	19	23	Medium smooth.
Thorburn's Earliest	2½	3¼	6¼	12	12	24	"
Table Queen	3¼	7	9	18	19¼	37¼	Smooth.
Thorburn's 1902	1	5½	3	14	9	23	Medium smooth.
Waldorf	1½	1½	4¼	9	7¼	16¼	Smooth.

TOMATOES Staked compared with those not Staked.

Number.	Name of Variety.	Ripe Fruit from 5 Plants.—Sept. 4.	Total Ripe Fruit from 5 Plants, Sept. 21.	Total Green Fruit from 5 Plants.	Total Fruit from 5 Plants.
		Lbs.	Lbs.	Lbs.	Lbs.
1	Brinton's Best—Not staked	2½	8	27½	35½
2	" Staked	1½	9	12½	21½
3	Early Leader—Not staked	4	14½	26	40½
4	" Staked	8	16½	8½	25
5	Early Ruby—Not staked	6¾	13¼	24	37¼
6	" Staked	4	17	14	31

EXPERIMENTS WITH GARDEN CORN.

Forty-five varieties of garden corn were planted May 28 on a clay loam soil. This land was previously in strawberries. No stable manure was used this season. The land was ploughed and worked up a few days before planting. Complete fertilizer, at the rate of 350 pounds per acre, was sown broadcast and harrowed in with the smoothing harrow. The corn was planted in rows three feet apart, and three kernels of corn planted in a group a foot apart and 1½ inches deep.

Each plot was two rows 16½ feet long. The corn was thinned to one plant to a foot by cutting out the weakest plants. It is better to thin by cutting off the plant than to pull it up, for by pulling, the remaining plant is liable to be disturbed. The season was not favourable for this crop, and many of the varieties did not mature sufficiently for table use. The following notes were taken of these varieties :—

CORN.

Name of Variety.	Length of Ears.	Size of Ears.	Remarks.
	Inches.		
Extra Early Beverly	5 to 6	Small to medium	All fit for table use.
Peep O'Day	5 " 6	" "	" "
Extra Early Cory	5 " 7	Medium	90 p. c. fit for table use.
Red Cob Cory	5 " 7	"	90 " "
Ringleader	5 " 6	"	90 " "
Eastern Extra Early	4 " 5	Small	80 " "
Ford's Early Sugar	5 " 6	"	80 " "
Tom Thumb	5 " 7	"	80 " "
Burbank's Early Maine	5 " 6	"	80 " "
Fuller's Early Yellow	7 " 10	Medium	80 " "
Vick's Extra Early	6 " 7	Medium to large	80 " "
Crosby's Early	5 " 7	Medium	60 " "
Early Six Weeks	3 " 4	Small	50 " "
Extra Early Premo	6 " 7	Large	40 " "
Oakview	6 " 7	Medium to large	40 " "
Extra Early Minnesota	7 " 8	Large	40 " "
Early Adams	6 " 7	"	40 " "
Mammoth White Cory	7 " 8	"	30 " "
New Champion	7 " 8	"	10 " "
Golden Bantam	4 " 6	Small	10 " "
Metropolitan	6 " 8	Large	10 " "
Nelson's Yellow	8 " 9	Medium	10 " "
Cosmopolitan	6½ " 8	Large	10 " "
Early Essex	6 " 8	"	10 " "
Kendall's Early Giant	6 " 7	"	5 " "
Stabler's Extra Early	7 " 8	"	5 " "
Honey Dew	6 " 8	"	5 " "

None of the following produced any heads fit for table use:—

Ne Plus Ultra, Potter's Excelsior, None Such, Earliest Sheffield, Marblehead Mammoth, Burlington Hybrid, Henderson, Landreth's Sugar, Lackey's Early, Quincy Market, Hickox Improved, Perry's Hybrid, Old Colony, Early Landreth Market, Early Concord, Early Amber Pop Corn, White Rice Pop Corn, White Pearl Pop Corn.

EXPERIMENTS WITH CABBAGE.

The seed was sown in shallow boxes April 3. The boxes were placed in a cold frame. This cold bed was earth two feet deep put into a frame set on the ground. The bed was used for a hot-bed the previous season, and was covered during the winter, and about March 1 glass sashes were put on it, and by April 1 the soil was all thawed out and quite warm.

The seed germinated slowly, but the plants were stocky and strong. They were fit to prick out April 27. They were set 3 by 3 inches apart into the cold frame bed, and by setting out time, May 19, were good, strong, healthy plants, well rooted. Twenty-five plants of a variety were planted, but the ravages of the root Maggot made it necessary to reduce the selection to 15 plants of each variety for the test.

The ground on which these were planted was manured in the fall of 1902 with 20 one-horse cart loads of stable manure per acre and ploughed. This was ploughed again in the spring and worked up, and 300 pounds of complete fertilizer per acre sown broadcast and harrowed in with the smoothing harrow. On June 15 a teaspoonful of nitrate of soda was scattered around each plant. The plants were set in rows three feet apart and thirty inches apart in the rows on level ground.

The cabbage thrives in a cool, moist atmosphere. The failure of plants to head is seldom experienced in these provinces. This condition is usually the result of very hot weather and a dry atmosphere, which we are not generally subjected to. The cabbage plant is a gross feeder, and if well supplied with food and a proper supply of moisture will generally succeed on any kind of soil. Unlike the tomato, it can be set out as early in the spring as the soil will permit of working properly; that is, providing the plants have been started under good conditions. If the plants have been forced in a green-house and set out May 1 a frost of over three degrees is liable to injure

them, while if grown under cool conditions and well hardened up before planting, they will stand any spring frosts to which they are likely to be exposed after May 1. If the plants are to be set out before the middle of May they must be started early enough to make strong and well rooted plants by that time.

The object of this experiment was to find out what sorts are best for early market. The heads were cut as soon as fit for market and the weights obtained. Forty-six varieties were included in this test.

CABBAGE

Name of Variety.	July 31.		Aug. 8.		Aug. 12.		Aug. 19.		Aug. 28.		Average weight of Heads, lbs.	Remarks.
	No. of Heads.	Lbs.	No. of Heads.	Lbs.	No. of Heads.	Lbs.	No. of Heads.	Lbs.	No. of Heads.	Lbs.		
Gregory's Earliest	3	6¾	7	18¾	4	13½	1	4½	....	....	2·90	Conical.
Earliest	4	9¾	3	8	3	10¼	4	11½	1	2½	2·80	"
Jersey Wakefield	4	8½	6	16	5	23	....	....	....	....	3·16	"
Paris Market	5	11¼	7	15½	....	...	3	6½	....	....	2·21	"
Early Express	5	12¾	4	13½	3	10¼	3	10	....	...	3·10	"
Miniature Marrow	3	4¼	8	13	4	6	....	...	....	....	1·55	Round.
Cracker Jack	3	8½	5	13¾	2	7	3	7	2	4½	2·71	Conical.
Charleston	1	3½	3	9¾	6	19	2	6½	3	10¼	3·26	"
Early Baseball	2	4½	5	9¾	4	9½	4	10	....	....	2·23	Round.
Etampes	7	14	4	7¾	4	9	....	....	....	....	2·05	Conical.
Bamberg's Earliest	1	2½	3	8	3	8½	4	15	4	9¼	2·88	Round, not compact.
Premier	....	....	....	....	3	14½	12	51½	....	....	4·40	Flat, round.
Early Eureka	....	....	3	10	4	10½	5	20	3	15	3·70	"
Early Dwarf York	1	2¼	....	....	4	14½	7	22	3	9	3·25	"
Improved Early Spring	....	....	....	....	6	19	6	22¾	3	12	3·58	"
Early Spring	....	....	....	....	6	21	5	21½	4	17	3·96	"
Winningstadt	....	....	....	....	6	18½	4	15	5	19¾	3·55	Conical.
Early Summer	....	.. .	3	9	4	18	5	19¾	3	10¼	3·80	Round.
First Early	....	....	....	....	6	23¾	6	22	3	11¾	3·83	"
	Aug. 19.		Aug. 28.		Sept. 2.		Sept. 10.		Sept. 14.			
Taber's Nonpareil	5	14½	5	17¾	3	10	2	7¾	....	....	3·33	"
Bismarck	2	11	1	4¾	4	19¾	4	31	4	22	5·90	Flat, round.
Reedland Early Drumhead	6	28	6	18¼	....	....	....	....	3	16	4·16	Round.
Early Flat Dutch	3	14½	2	9	3	13¾	7	28½	....	....	4·38	Flat, round.
Midsummer	6	26	1	4	2	12¼	2	9½	4	18½	4·68	Round.
Premium Flat Dutch	3	12	2	9	2	12½	5	33	3	18	5·63	Flat, round.
All Seasons	4	22¼	4	19½	3	13	2	11¼	2	16	5·46	"
All Head	3	16¾	3	16¼	5	18¼	4	14½	....	....	4·38	Flat, round.
Market Gardeners	2	7½	3	15	4	20½	3	14	3	14¾	4·78	Round.
Enkhuisen	4	12	6	21½	2	8	3	12½	....	....	3·60	"
Improved Brunswick	2	10¼	4	20¾	1	3¾	3	15	5	23	4·85	Flat, round.
Dutch Winter	1	4½	4	28½	2	10¼	2	11	6	32	5·75	"
Stone Mason	1	5½	2	12½	2	11	2	22	8	44½	6·36	"
	Aug. 28.		Sept. 2.		Sept. 10.		Sept. 14.		Sept. 30.			
Late Flat Dutch	3	23	3	14½	....	....	5	44	4	29½	7·40	Flat.
Lupton	1	5	2	9½	4	28	8	41½	....	....	5·56	Flat, round.
Mammoth Rock Red	1	5¼	1	4	....	....	4	33	9	51¾	6·26	Round.
Large Red Drumhead	1	6	1	5½	2	11	6	52½	5	32	7·13	Flat, round.
Hard Heading	2	7¾	....	....	4	20	4	18	5	23½	4·61	Round.
Cannon Ball	1	4¾	....	....	4	27	5	28¼	5	26½	5·76	"
White Giant	....	....	3	12¾	2	14	3	17½	7	25¾	4·66	"
Danish Baseball	1	3	....	....	4	26¼	2	15	8	42¾	5·80	"
Vandergaw	3	16½	1	7½	1	9	2	12	8	52¼	6·48	Flat, round.
Houser	4	22	....	....	2	10¼	3	26	6	33¾	6·13	Round.
Succession	3	12	....	....	3	14½	2	9¾	7	37¾	4·93	"
Hartford	....	....	4	32	....	....	2	10	9	42	5·60	"
Autumn King	....	....	4	28	....	....	3	23¼	8	67	7·88	Flat, round.
Solid Emperor	....	....	....	....	10	72	2	14	3	19½	7·03	"

EXPERIMENTS WITH EARLY POTATOES.

The object of this experiment was to gain information as to the relative earliness of different sorts of early potatoes. Seventeen sorts were selected and planted in rows, 26 inches apart, and the seed dropped one foot apart in the rows. They were given cultivation similar to the field crop of potatoes.

The ground was previously in vegetables. It was manured in the fall of 1902 with twenty one-horse cart loads of stable manure per acre and ploughed under. This was worked up in the spring by ploughing and harrowing with the disc and springtooth harrows, and once with the smoothing harrow, after 300 lbs. per acre of complete fertilizer had been sown broadcast. Drills were run with the plough, the seed dropped, and covered with the plough.

The seed started regularly and a strong vigorous growth was made up to the first of August, when the Early Blight or leaf spot disease *(Macrosporium solani)* made its appearance. This blight is different from the late blight *(Phytophthora infestans)*. The plants had been dusted with Bug Death at the rate of 100 lbs. per acre July 20, and on the appearance of this blight Bordeaux mixture was sprayed on the plants August 4. The plants, however, had already been infected and this did little good. The field plots of potatoes, which were thoroughly sprayed with Bordeaux mixture July 20, showed no signs of the disease. The plants made no practical gain after August 20, as will be seen from the results given below, and the vines were nearly all dead by September 4. There were no rotten tubers in the field. This disease, unlike the late blight, is not accompanied by a decay of the tubers.

A plot of each variety was dug August 8, and duplicate ones August 20 and September 4. The yield from each plot, one row 66 feet long; is given in the following table, also the average yield of all the plots at the different dates of digging. It will be seen that the yield per acre increased 84 bushels per acre in the twelve days from August 8 to August 20.

EXPERIMENTS WITH EARLY POTATOES.

Name of Variety.	Dug Aug. 8.		Dug Aug. 20.		Dug Sept. 4.	
	Marketable per plot.	Not marketable per plot.	Marketable per plot.	Not marketable per plot.	Marketable per plot.	Not marketable per plot.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Irish Cobbler	46	6	66½	8	65½	13
Early Andes	37	6	61½	9	48	8¼
Early Michigan	35¾	4	45½	8	47¾	11¼
Reeves' Rose	35	7¾	47½	11	48	8½
Crown Jewel	34½	8	55	8½	45¼	13
Beauty of Hebron	34	7	56¾	9	45	9¾
Bovee	33½	6	45¼	5¼	42¼	11
Pearce's Extra Early	33½	5	53½	7¼	50¾	11
Canadian Beauty	33	4¼	51½	3¾	54½	7¾
Early Harvest	32	6½	42½	7¾	43¼	11¼
Early Sunrise	31¼	5	33¼	6¼	39¾	6
Earliest of all	30½	3	42	3¾	42	7
Early Ohio	29½	3½	41¾	2¾	58	4½
Early Gem	27	3¾	44½	5½	52½	6¼
Rawdon Rose	26¼	3	50	5½	41¾	10½
Early Rose	25	2½	31½	6	28¼	8½
Early Norther	17¾	3½	60	3	60½	6

Average Yield of all the plots.

When Dug.	Marketable.		Not Marketable.	
	Bush.	Lbs.	Bush.	Lbs.
August 8	157	56	24	34
" 20	241	56	32	9
September 4	237	7	44	46

POTATOES CUT IN DIFFERENT WAYS FOR PLANTING.

The object of this experiment was to ascertain whether any gain was made by cutting potatoes in different ways for seed. The variety Bovee was used. The land on which these tests were made was similar to that on which the early potatoes were grown, and received the same treatment in every particular.

On plot No. 1 small whole potatoes were planted; No. 2 medium whole potatoes; No. 3 the potatoes were cut in two crosswise, and both halves of the potato planted; No. 4, the potatoes were cut in two lengthwise and both halves planted; No. 5, the potatoes were cut in two crosswise, and the seed end half only planted; No. 6, the potatoes were cut in two crosswise, and the butt end half only planted; No. 7, a piece with only one eye; No. 8, a piece with two eyes, and No. 9 a piece with three eyes.

Each plot was one row 33 feet long. They were dug on August 20, and duplicate plots dug September 4. The following yields were obtained:—

Number.	How Cut.	Dug Aug. 20		Dug Sept. 4.	
		Marketable per plot.	Not marketable per plot.	Marketable per plot.	Not marketable per plot.
		Lbs.	Lbs.	Lbs.	Lbs.
1	Small whole	18¼	6	12½	10½
2	Medium whole	28	13½	32	18¼
3	Cut in two crosswise	20¾	6½	24¼	10
4	Cut in two lengthwise	30	4	36	8¼
5	Seed end half	24½	9	32	11
6	Butt end half	22¾	5½	27½	9
7	One eye	10½	½	12	2
8	Two eyes	24	½	22¾	2
9	Three eyes	22	2	26	4½

LIMING *versus* NOT LIMING POTATO SEED FOR PLANTING.

This experiment was for the purpose of testing the value of rolling cut tubers ready for planting in air-slacked lime. For this test the early potato plots were divided into two plots, on one-half of which seed rolled in lime was planted, and the other half planted with seed not limed. The seed was cut just before planting.

These plots were dug August 20, and duplicate ones September 4. Each plot dug in this test was 17 rows (each row a variety), 33 feet long and 26 inches apart. The

yield per acre has been calculated from the weight of marketable and unmarketable tubers obtained. As these plots were the same as the early potato plots, the premature decay of the vines already mentioned resulted in no practical increase of yield after the digging of August 20.

How Treated.	Dug Aug. 20.						Dug Sept. 4.					
	Marketable per acre.		Not marketable per acre.		Total Yield per acre.		Marketable per acre.		Not marketable per acre.		Total Yield per acre.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Limed.	246	19	33	50	280	9	242	31	49	52	292	23
Not limed..	235	19	30	29	265	48	232	10	39	40	271	50

I have the honour to be, sir,
Your obedient servant,

W. S. BLAIR,
Horticulturist.

EXPERIMENTAL FARM FOR MANITOBA.

REPORT OF S. A. BEDFORD, SUPERINTENDENT.

BRANDON, MANITOBA, November 30, 1903.

Dr. WILLIAM SAUNDERS,
Director Dominion Experimental Farms,
Ottawa, Canada.

SIR,—I have the honour to submit herewith my fifteenth annual report, with details of experiments undertaken and work accomplished on the Brandon Experimental Farm during the past year.

The past winter was a very favourable one, snow came fairly early and remained all winter; severe storms were rare and the weather was generally favourable for out of door work. Spring opened up on April 3, and a small area of wheat was sown on that date in some parts of the province, but colder weather followed and seeding did not commence on this farm until about April 16. May began fine, but cool; by the middle of the month the temperature had increased, and a much-needed rain fell on the 16th; the remainder of the month was showery and favourable for growth.

The early part of June set in very warm, and growth was very rapid, but later in the month grain on fall and spring ploughing was in great need of rain, particularly in the eastern portion of the province.

July and August were unusually cloudy and cool, with much east wind and frequent showers; fogs were also prevalent.

September opened with a severe frost on the 4th, injuring all tender vegetation; fortunately the bulk of the grain throughout the province was cut by this date, but much fodder corn and other tender vegetation was injured. On the 12th and 13th of this month occurred one of the worst snow storms ever recorded here during September. The storm found nearly all the grain in the stook, and stacking was delayed for about two weeks and the quality of wheat reduced two, and in some cases, three grades.

During the last week of September and nearly all October the weather was unusually fine and gave opportunity for threshing and fall ploughing, which had been much delayed.

WHEAT.

This important grain has had much to contend with during the past season; drought threatened it during June, rust was very prevalent on some of the stronger soils, and unseasonable weather in September threatened to spoil the sample, but in spite of all these drawbacks, the sample is generally a fair one, and the prices are above the average; so that farmers will realize nearly an average return for their crop. On this farm both the yield and sample were greatly injured by rust, so prevalent, especially on the valley land during the close, moist days of August; the uniform test plots suffered most from this cause, possibly this was owing to the well compacted summer-fallow soil retaining the moisture and causing an over-rank growth.

On the larger fields of grain where the soil was ploughed later in the season and was somewhat drier, the straw was fairly bright, and there was scarcely any injury from this cause; the sample was plump and weighed the full standard weight.

As usual, the Goose and Roumanian wheats were practically free of rust, and were for this reason much more productive than any of the other varieties and also heavier per bushel.

The following varieties of wheat were sown here for the first time this year, but none of them promise to equal our standard varieties, Red and White Fife.

Velvet Don wheat has some resemblence to Goose wheat, but was somewhat earlier, and the beard is dark in colour.

Mishriki and Oregon Club were on trial for the first time this year, but neither of them are promising.

Gejar is evidently a fall wheat, and it produced only a few scattered heads.

The Blue-stem grown among the uniform test plots this year is from the western states, and is quite distinct from the variety with blue tinted straw and velvet chaff usually grown by that name in this province.

Owing to rust many of the kinds of wheat in the uniform test of varieties ripened prematurely, and for that reason the dates of ripening given are only approximate.

Sixty-four varieties of spring wheat were tested this year. These were sown from April 20 to 27, on black loam soil, in plots of one-twentieth acre each. All the seed was treated with bluestone, and all the varieties were quite free of smut.

Spring Wheat.—Test of Varieties.

Name of Variety.	Date of Sowing.		Date of Ripening.		No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Heads.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
						In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
Goose	Apr.	24	Aug.	28	126	41	Weak	3	Bearded..	5,620	46	20	63½	None
Roumanian	"	24	"	26	124	51		2½	" ..	5,120	44	40	63	Slightly.
Velvet Don	"	27	"	28	123	42	Stiff..	2½	" ..	6,200	40	00	63	None.
Australian No. 9	"	21	"	20	121	49	"	3	Beardless.	4,560	34	00	60	Slightly.
Chester	"	21	"	19	120	37	Fair..	3¾	" ..	3,190	33	30	60¼	Badly
Blair	"	21	"	21	122	45	"	3	" ..	2,710	31	30	59	Consid'rably
Fraser	"	24	"	18	116	41	Weak	3	Bearded..	3,320	31	20	59	Badly.
White Russian	"	22	"	24	124	45	Fair..	4	Beardless"	4,860	30	40	58	Slightly.
Wellman's Fife	"	22	"	23	123	44	Stiff..	4	" ..	5,580	30	20	57½	"
Dawn	"	21	"	18	119	40	"	3½	" ..	2,980	30	20	58	Badly.
Angus	"	22	"	20	120	39	Fair..	3	" ..	4,600	30	00	58	Consid'rably
Benton	"	24	"	24	122	43	Weak	4	" ..	3,440	29	20	58½	Slightly.
Percy	"	20	"	20	122	47	Stiff..	3½	" ..	4,850	29	10	58	"
Crawford	"	21	"	19	120	44	Fair..	4	" ..	3,260	29	00	59½	"
Bishop	"	21	"	21	122	37	Stiff..	3½	" ..	3-680	28	40	60	"
Weldon	"	20	"	18	120	47	Fair .	4	" ..	4,680	28	40	58	Badly.
Herisson Bearded	"	24	"	26	124	40	Weak	2	Bearded..	3,500	28	20	57	"
Hungarian	"	24	"	24	122	48	Fair .	3	" ..	4,300	28	20	56	Slightly.
Advance	"	22	"	21	121	46	"	4	" ..	4,310	28	10	59	"
Alpha	"	21	"	22	123	50	Stiff .	3½	Beardless.	4,120	28	00	58	"
Plumper	"	22	"	25	125	42	Fair .	3½	Bearded..	3,720	28	00	59	Badly.
Admiral	"	21	"	21	122	42	Stiff .	3¾	Beardless.	3,540	27	40	58	Slightly.
Huron	"	22	"	23	123	41	"	4	Bearded..	3,540	27	40	59	Consid'rably
Stanley	"	21	"	19	120	44	"	3	Beardless.	4,540	27	40	59	Badly.
White Fife	"	22	"	23	123	42	Fair .	3	" ..	2,340	27	40	58	Consid'rably
Cartier	"	24	"	21	119	41	Weak	3	Bearded..	3,740	27	40	58½	Badly.
Byron	"	22	"	23	123	27	"	3	" ..	4,240	27	40	59	"
Norval	"	22	"	22	122	41	Stiff .	3	" ..	3,580	27	00	59½	Slightly.
Vernon	"	24	"	24	122	45	"	3	" ..	4,280	27	00	57	"
Cassel	"	21	"	21	122	46	"	4	Beardless.	3,390	26	50	57½	Badly.
Minnesota No. 149	"	21	"	23	124	49	"	4	. ..	3,390	26	50	58½	Slightly.
Japanese	"	24	"	18	116	36	Weak	3	Bearded..	3,200	26	40	58	Badly.
Laurel	"	22	"	23	123	43	"	4	Beardless.	6.840	26	00	56½	"
White Connell	"	22	"	23	123	41	Fair .	4	" ..	3,840	26	00	58	"
Rio Grande	"	22	"	22	122	48	"	3	Bearded..	5,040	26	00	58¼	"
Monarch	"	22	"	23	121	45	Stiff "	3½	Beardless.	3,640	26	00	58½	"
Red Fern	"	24	"	24	122	54	"	4	Bearded..	4,450	25	50	58	Slightly.
Hastings	"	21	"	19	120	40	Fair .	3	Beardless.	2,460	25	40	58	Consid'rably
Robin's Rust Proof	"	22	"	22	122	44	"	3½	" ..	3,670	25	30	59	Slightly.
Clyde	"	22	"	24	124	45	Weak	4	" ..	3,770	25	30	56½	"

SPRING WHEAT.—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Heads.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
Minnesota No. 181....	Apr. 21	Aug. 23	123	43	Stiff .	4	Beardless.	3,500	25	00	59½	Badly.
Mishriki..............	" 22	" 19	119	27	"	2½	Bearded..	3,700	25	00	60½	"
Crown..................	" 24	" 22	120	48	Weak	3	" ..	5,040	24	50	55	"
Pringle's Champlain..	" 24	" 21	119	47	"	4	" ..	5,310	24	50	55	Slightly.
Red Fife..............	" 22	" 23	123	44	Stiff .	4	Beardless.	5,140	24	20	57	"
Preston...............	" 22	" 23	123	47	Fair .	3	Bearded..	3,580	23	40	59	"
Progress.............	" 22	" 23	123	42	"	3	Beardless.	2,580	23	40	58½	"
Australian No. 27.....	" 21	" 21	122	48	Stiff .	3	" ..	3,400	23	20	59	"
Blue Stem.............	" 22	" 22	122	45	Fair..	3¾	" ..	4,520	23	00	60	Badly.
Early Riga............	" 21	" 18	118	38	"	3	" ..	4,260	22	20	58	"
Australian No. 19....	" 21	" 24	125	42	"	3	" ..	3,060	22	20	58½	Slightly.
Australian No 25......	" 22	" 24	124	46	Stiff .	4	" ..	3,080	22	00	58	"
Australian No. 23.....	" 22	" 24	124	43	Fair .	4	" ..	2,890	21	50	57	Badly.
Australian No. 10.....	" 21	" 24	125	42	"	4	" ..	2,900	21	40	58½	Slightly.
Essex..................	" 22	" 22	122	47	Weak	4	" ..	4,910	21	30	57	Badly.
Minnesota No. 163....	" 21	" 24	125	48	Stiff .	4	" ..	4,320	21	20	58	Slightly.
Countess..............	" 22	" 21	121	44	Weak	3½	" ..	3,030	20	50	56	Badly.
Colorado..............	" 24	" 24	122	51	Fair .	3½	Bearded..	4,440	19	20	57	"
Minnesota No. 169....	" 21	" 24	125	47	"	3	Beardless.	4,930	18	30	50	"
Red Swedish...........	" 24	" 22	120	44	Weak	3	Bearded..	5,110	18	10	55½	"
Australian No. 13.....	" 21	" 24	125	46	Stiff..	4	Beardless.	3,720	18	00	56	Slightly.
Oregon Club...........	" 22	" 19	119	43	Fair..	2	" ..	4,080	15	20	43½	Badly.
Sejar..................	" 22	....	...	44	Stiff..	4	" ..	5,000	5	00	53	Slightly.

AVERAGE Results of a Test of Nine Varieties of Wheat for the past Seven or Eight Years.

Varieties.	Years under Test.	Yield per Acre.	
		Bush.	Lbs.
Goose..........	8	41	58
White Fife..........	8	36	35
Crown..........	8	35	29
Monarch..........	8	35	26
Red Fife..........	8	34	43
White Russian..........	8	33	58
White Connell..........	8	33	47
Rio Grande..........	8	33	24
Preston..........	7	32	38

VARIETIES OF WHEAT GROWN FROM SELECTED AND UNSELECTED SEED.

As in former years, the largest heads were selected from standing grain of last year, and the seed was sown this year for a comparison with unselected seed, from the same plots.

The plots were all one-twentieth acre, and each pair were sown in close proximity; the soil was a black loam. The accompanying table gives the result of each individual variety. A summary is also given, which shows the average yield from the selected wheat to be eleven pounds per acre more than the unselected.

All were sown on summer fallowed land from April 20 to 27.

WHEAT.

Variety.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Variety.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
	Lbs.	Bush.	Lbs.	Lbs.		Lbs.	Bush.	Lbs.	Lbs.
Goose—Unselected	5,620	46	20	63	Advance—Unselected	4,310	28	10	58
" Selected	5,060	45	40	63¾	" Selected	4,520	29	40	56½
Roumanian—Unselected	5,120	44	40	63½	Alpha—Unselected	4,120	28	..	58
" Selected	5,100	48	20	63½	" Selected	4,100	21	40	57½
Speltz—Unselected	5,050	43	50	47½	Plumper—Unselected	3,720	28	..	57
" Selected	6,340	54	20	47½	" Selected	4,300	28	20	58½
Australian No. 9—Unselected	4,560	34	..	58	Admiral—Unselected	3,540	27	40	57½
" Selected	2,540	31	..	57½	" Selected	3,190	20	10	58
Chester—Unselected	3,190	33	30	60½	Huron—Unselected	3,540	27	40	58¾
" Selected	3,030	32	50	60	" Selected	3,720	28	..	58
Blair—Unselected	2,710	31	30	57½	Stanley—Unselected	4,540	27	40	57½
" Selected	3,600	30	..	57½	" Selected	3,230	29	30	58
Fraser—Unselected	3,320	31	20	59	Norval—Unselected	3,580	27	..	59½
" Selected	3,740	32	40	60	" Selected	3,200	26	40	60½
Dawn—Unselected	2,980	30	20	57	Japanese—Unselected	3,200	26	40	57½
" Selected	3,460	29	..	58	" Selected	2,940	27	40	58
Percy—Unselected	4,850	29	10	59	Rio Grande—Unselected	5,040	26	..	59
" Selected	4,010	29	50	59¼	" Selected	5,180	23	40	58
Crawford—Unselected	3,260	29	..	55½	Red Fern—Unselected	4,450	25	50	58½
" Selected	3,330	31	10	56	" Selected	4,910	21	50	59
Bishop—Unselected	3,680	28	40	57½	Hastings—Unselected	2,460	25	40	56
" Selected	3,980	33	40	58	" Selected	2,640	27	40	58½
Weldon—Unselected	4,680	28	40	59	Preston—Unselected	3,680	23	40	59
" Selected	2,340	27	40	58½	" Selected	3,520	24	40	59½
Herisson Bearded—Unselected	3,500	28	20	56	Early Riga—Unselected	4,260	22	20	57
" " Selected	3,260	27	20	57½	" Selected	4,210	26	30	57

	Bush.	Lbs.
Average yield of 26 varieties (selected)	30	10
" 26 " (unselected)	29	59

FIELD PLOTS OF WHEAT.

The larger fields of wheat were ploughed late last summer, and did not receive as much surface cultivation as the test plots; probably this accounts for the smaller amount of rust in these fields; the sample of grain was much heavier per bushel and better in every respect.

All were sown on summer fallow, in the proportion of one and one-half bushels of seed per acre.

Variety.	Character of Soil.	Size of Plot.	Date of Sowing.	Date of Ripening.	Weight per Bush.	Yield per Acre.	
					Lbs.	Bush.	Lbs.
Preston	Clay loam	5 acres	April 17	August 21	62	31	27
White Fife	"	3 "	" 21	" 28	61	38	10
Monarch	"	2 "	" 21	" 26	62	30	20
White Connell	"	2 "	" 20	" 26	63	41	20
Red Fife	"	3 "	" 20	" 28	62	26	50
Percy	"	2 "	" 18	" 20	62	31	30
Stanley	"	2 "	" 18	" 20	62	31	20

DIFFERENT METHODS OF PREPARING LAND FOR SPRING WHEAT.

In this series of tests the result is somewhat unusual, the summer fallowed plot giving the smallest return. This was no doubt owing to the grain on this plot growing unusually rank and rusting more than the others.

The plots in this experiment were all one-twentieth acre each; the soil a rich clay loam. All were sown on April 18.

Name of Variety.	Previous Crop.	Rust.	Date of Ripening.	Yield per Acre.		Weight per Bush.
				Bush.	Lbs.	Lbs.
Wheat—Red Fife	Turnips	Little	August 20	30	10	58
" "	Millet	"	" 20	29	..	54
" "	Sunflowers	Badly	" 20	28	40	54
" "	Flax	"	" 20	28	20	52
" "	Horse Beans	"	" 20	28	10	51
" "	Pease	"	" 20	26	40	55
" "	Summer fallow	Very badly	" 20	26	10	54

A TEST OF GRAIN DRILLS.

Disc-drills, a comparatively new implement, are becoming extensively used in many parts of the province, and some extravagant claims are made for them. From the following table it would appear that there is very little difference in yield between the two ways of sowing.

The size of the plots was one-twentieth acre; the soil a sandy loam, which had been summer fallowed.

Variety.	Kind of Drill.	Sown.	Ripe.	Days Maturing.	Yield per Acre.		Weight per Bush.
					Bush.	Lbs.	Lbs.
Red Fife	Shoe drill	April 24	August 25	123	28	10	57
"	Disc drill	" 24	" 25	123	27	20	56½

EXPERIMENTS WITH THE USE OF BARN YARD MANURE.

During several seasons experiments have been carried on with fertilizers on the lower portion of this farm, but with very unsatisfactory results. This year a series of plots for this purpose were laid out on the upper portion of the farm, where the soil is quite light and somewhat exhausted. It will be seen from the accompanying table that the result is again somewhat contradictory.

The size of the plots in this series was one-twentieth acre, and the soil a very light sandy loam, the previous crop being wheat.

The varieties of grain sown were Red Fife wheat and Mensury barley.

Number	Kind of Grain.	How Treated.	Sown.	Ripe.	Yield per Acre.		Weight per Bush.
					Bush.	Lbs.	Lbs.
1	Wheat	10 loads per acre rotted manure	April 20	August 23	13	30	58
2	"	No manure	" 20	" 23	16	10	58
3	"	10 loads per acre fresh manure	" 20	" 23	18	..	58
6	"	No manure	" 20	" 23	16	30	58
11	Barley	No manure	May 14	" 14	20	..	47½
12	"	10 loads per acre fresh manure	" 14	" 14	16	12	47½
13	"	10 " rotted "	" 14	" 14	18	6	47½

EXPERIMENTS WITH ARTIFICIAL FERTILIZERS.

The tests with chemical fertilizers carried on for the past three years were again undertaken this year, but owing to an unusual interference the test was spoilt. The plots were laid out in a somewhat secluded location, and shortly after the crop was cut, it was nearly all destroyed by prairie chickens.

SMUT PREVENTIVES IN WHEAT.

Although it is now generally recognized by the older residents that injury from smut can be prevented, many new-comers are either ignorant of the risk in sowing untreated grain or else do not know of a preventive, and every year there is still considerable loss from this cause.

This year's test included the use of both bluestone and formalin, and both of these preparations were effective in preventing injury from this cause whether they were applied by steeping or sprinkling.

The seed used was badly 'tagged' with smut, and it will be noticed from the accompanying table that nearly 20 per cent of the crop from untreated seed was destroyed, while the treated seed was practically free of smut.

Variety.	How Treated.	Good Heads on 9 Sq. Ft.	Smutty Heads on 9 Sq. Ft.
Red Fife	Steeped for 5 minutes in 4½ oz. formalin to 10 galls. of water ..	306	None.
"	Sprinkled with 9 oz. of formalin to 10 galls. of water	419	"
"	Steeped for 5 minutes in 1 lb. of bluestone to 3 pails of water .	264	1
"	Sprinkled with 1 lb. bluestone to 1 pail of water..............	253	None.
"	Not treated....................................	383	65

EXPERIMENTS WITH SPELT AND EMMER.

Three newly introduced varieties of emmer and spelt were tested this year; none of these are as promising as the common emmer in general use here, the yield of grain being smaller and the weight per bushel less.

The size of the plots was one-twentieth acre for the common spelt and one-fortieth for the others. The soil was a sandy loam which had been summer-fallowed.

Variety.	Sown.	Ripened.	Length of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.
			Inches.	Inches.	Bus.	Lbs.	Lbs.
White Emmer (Common Emmer known also as Spelt)	April 24..	Aug. 29..	42	2½	43	50	47½
Red Emmer....	" 27..	" 28..	43	3	38	40	39
Smooth Spelt	" 27..	" 26..	41	6	29	20	26
White Bearded Spelt	" 27..	" 25..	41	6	27	00	26

In all these varieties the yield per acre is based on a bushel of 60 lbs. No allowance, however, has been made for the husk. When comparing these yields with clean wheat at least 20 per cent should be deducted from the emmer or spelt to make the comparison a fair one.

A CROP OF SPELT AS A PREPARATION FOR OTHER GRAIN.

Very little is known regarding the influence of spelt (emmer) on the succeeding crop; with a view of gaining some light on this subject, three sets of plots were laid out. One was sown with wheat, one with oats, and one with barley; the result was fairly uniform, and in each series the plot sown the previous year with spelt gave the largest return, followed by summer-fallow; the wheat stubble giving the smallest crop in each case.

The spelt shelled badly in 1902, and the volunteer crop was very apparent this year, both in the field and threshed grain, and probably increased the yield of grain.

The size of the plots was one-twentieth acre, and the soil a sandy loam.

Grain sown 1903.	Previous Crop.	Sown.	Ripened.	Yield per Acre.		Weight per Bushel.
				Bus.	Lbs.	Lbs.
Wheat Red Fife	Spelt (Emmer)	April 18	Aug. 24	51	40	57½
" "	Summer fallow	" 18	" 24	29	40	57
" "	Wheat	" 18	" 24	26	00	58
Oats, Banner	Spelt (Emmer)	" 27	" 25	100	30	37½
" "	Summer fallow	" 27	" 24	92	12	37
" "	Wheat	" 27	" 24	88	28	37
Barley, Mensury	Spelt (Emmer)	May 11	" 7	57	24	47½
" "	Summer fallow	" 11	" 7	55	20	48
" "	Wheat	" 17	" 7	28	16	47½

ROTATION OF CROPS.

In acordance with your instructions arrangements were made during 1899 for a series of rotation plots on one-half acre each, the principal object in view being the maintenance of the fertility of the soil, by ploughing under a leguminous crop every third year, instead of the usual summer-fallow.

The soja beans were sown in rows 14 inches apart, using 60 pounds of seed per acre; the red clover was sown in the proportion of 12 pounds of seed per acre and the mixed clovers in the proportion of eight pounds of alfalfa and six pounds of alsike per acre. These leguminous plants were ploughed under each year when they reached their fullest development. The order of rotation is as follows :—

No.	First Year.	Second Year.	Third Year.
1	Wheat	Oats	Soja Beans.
2	"	Wheat	Pease.
3	"	Oats	Tares.
4	"	Wheat	Red Clover.
5	"	Barley	Alfalfa and Alsike.
6	Pease	Wheat	Wheat.
7	Tares	"	Oats.
8	Soja Beans	"	"
9	Red Clover	"	Wheat.
10	Alfalfa and Alsike	"	Barley.
11	Rape	"	Summer-fallow.
12	Wheat	"	"
13	"	Oats	"
14	"	Barley	"
15	"	Wheat	Oats.
16	"	Barley	"
17	Oats	Soja Beans	Wheat.
18	Wheat	Pease	"
19	Oats	Tares	"
20	Wheat	Red Clover	"
21	Barley	Alfalfa and Alsike	"
22	Rye	Summer-fallow	"

In 1901 the first series of three years was completed. Owing to the unusual high water in the Assiniboine river last year the field was left fallow. This year the second series of three years of rotation was commenced, with the following result:—

ROTATION OF CROPS.

First year of the second series.

No.	Name of Varieties.	Date of Sowing.	Date of Ripening.	Yield per Acre.		Weight per Bushel.
				Bush.	Lbs.	Lbs.
1	Wheat—Red Fife	April 22	August 25	26	45	58
2	" "	" 22	" 25	31	45	58
3	" "	" 22	" 25	23	25	58
4	" "	" 22	" 25	28	39	58
5	" "	" 24	" 25	30	45	58
6	Pease—Golden Vine	" 24	Ploughed under			
7	Tares	May 11	"			
8	Soja Beans	June 11	"			
9	Clover—Red	April 23	"			
10	Clover Alfalfa and Alsike	" 23	"			
11	Rape	June 11	"			
12	Wheat—Red Fife	April 24	August 25	28	45	58
13	" "	" 24	" 25	27	13	58
14	" "	" 24	" 25	30	45	58
15	" "	" 24	" 25	28	01	58
16	"	" 24	" 25	29	40	58
17	Oats—Banner	May 7	" 25	56	24	37
18	Wheat—Red Fife	April 24	" 25	24	30	58
19	Oats—Banner	May 7	" 28	54	00	37
20	Wheat—Red Fife	April 24	" 25	26	15	58
21	Barley—Mensury	May 7	" 28	44	20	47
22	Rye—Spring	April 25	Ploughed under			

EXPERIMENTS WITH OATS.

The past season has been favourable for this grain in all parts of the province. On the experimental farm the yield is above the average, and the sample plump but slightly discoloured.

Swedish Select, grown this year for the first time, is a promising white variety with a very handsome branching head, and it proved very productive.

Golden Fleece, another new variety, did not prove nearly so productive.

Since the four cross-bred varieties, viz., Kendal, Milford, Pense and Olive, have been divided into white and black kinds, they have a much more uniform appearance, but were not very productive this year.

The plot of Banner oats was adjoining a well travelled road, and the grain was badly injured by vehicles. This accounts for the reduced yield of this variety.

The Tartar King oats used as seed for this test was very large and plump; this, combined with an almost total absence of stooling, made the sowing much too thin and reduced the yield.

The tests were made with forty-five varieties, on plots of one-twentieth acre each. The soil was a sandy loam; the previous crop Brome grass, and two bushels of seed per acre was used, sown with a drill. Golden Fleece was sown on May 14, and all the others on May 5 and 6.

(Photo. by C. E. Saunders.)

PLOTS OF VEGETABLES AT BRANDON.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per acre.		Weight per Bushel.	Rusted.
					In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Buckbee's Illinois...	May 5	Aug. 21	108	47	Stiff..	10	Branching..	3,940	119	14	36	Slightly
2	Early Golden Prolific	" 5	" 22	109	47	" ..	10	" ..	4,280	115	10	37½	"
3	New Zealand........	" 5	" 27	115	51	" ..	10	Sided......	4,700	114	24	35	Badly
4	Wide Awake.......	" 5	" 23	110	49	" ..	7½	Branching..	4,340	113	18	37½	Slightly
5	Golden Giant........	" 5	" 29	116	48	" ..	10	Sided.......	4,580	109	14	37	"
6	Abundance..........	" 5	" 20	107	51	" ..	9	Branching..	4,480	109	14	38½	"
7	Waverley.........	" 5	" 20	107	52	" ..	8	" ..	4,780	109	14	38½	"
8	Lincoln..............	" 5	" 22	109	47	" ..	9	" ..	4,700	108	28	38	"
9	Danish Island	" 5	" 22	109	49	" ..	9	" ..	4,720	108	8	38	"
10	Holstein Prolific....	" 5	" 22	109	47	" ..	7	" ..	4,430	107	32	36	"
11	Irish Victor.........	" 5	" 22	109	47	" ..	10	" ..	4,140	107	22	38	"
12	Golden Tartarian....	" 5	" 25	112	49	" ..	10	Sided.......	4,390	106	6	37	Badly
13	Improved Ligowo...	" 5	" 20	107	49	" ..	8	Branching..	4,810	105	20	42	Slightly
14	Thousand Dollar	" 5	" 20	107	52	" ..	7	" ..	4,520	105	10	39½	"
15	Columbus..........	" 5	" 21	108	44	" ..	8	" ..	4,150	104	14	36½	"
16	Twentieth Century..	" 5	" 22	109	45	" ..	10	" ..	4,050	104	14	38½	"
17	White Giant	" 5	" 22	109	45	" ..	8	" ..	4,270	103	28	37	"
18	White Schonen.......	" 5	" 22	109	48	" ..	7	" ..	4,680	100	20	36	"
19	American Beauty....	" 5	" 22	109	44	" ..	8	" ..	3,920	99	14	36½	"
20	Wallis...............	" 5	" 23	110	47	" ..	8	" ..	4,230	99	4	36	"
21	Siberian	" 5	" 23	110	45	" ..	8	" ..	4,240	98	28	35½	"
22	Mennonite..........	" 5	" 18	105	46	" ..	6	" ..	3,840	98	28	39	"
23	American Triumph..	" 5	" 22	109	44	" ..	8	" ..	3,650	98	18	37	"
24	Salines..............	" 5	" 24	111	51	" ..	8	" ..	4,400	95	10	36	"
25	Improved American.	" 6	" 21	107	50	" ..	7½	" ..	4,360	95	10	36½	"
26	Swedish Select......	" 6	" 20	106	43	" ..	6	" ..	3,700	94	4	42	None
27	Golden Beauty......	" 5	" 22	109	47	Fair..	8	" ..	3,460	93	18	36½	Slightly
28	Black Beauty.	" 6	" 20	106	43	" ..	8	" ..	3,840	93	8	37½	"
29	Bavarian............	" 6	" 23	109	47	Stiff..	9	" ..	4,360	91	26	36½	"
30	Scotch Potato........	" 5	" 22	109	39	" ..	8	" ..	4,680	91	26	38	"
31	Kendal White.....	" 6	" 26	109	44	" ..	9	Sided.......	2,780	91	26	36	"
32	Sensation............	" 5	" 21	108	46	" ..	7	Branching..	3,900	91	6	41	"
33	Pioneer.............	" 6	" 20	106	40	Fair..	8	" ..	3,130	88	18	36	"
34	Olive Black.........	" 6	" 26	112	45	" ..	7	" ..	3,700	88	8	37½	"
35	Milford Black.......	" 6	" 26	112	43	" ..	9	Sided.......	3,630	87	12	36	"
36	Pense Black........	" 6	" 26	112	44	" ..	9	"	3,700	85	10	35½	"
37	Banner..............	" 5	" 20	107	49	Stiff..	9	Branching..	5,540	84	4	38	"
38	Golden Fleece......	" 14	" 23	99	45	" ..	8	" ..	4,540	84	4	35½	None
39	Goldfinder..........	" 5	" 24	111	48	" ..	8	" ..	5,060	83	18	36	Slightly
40	Joanette..........	" 6	" 21	107	34	Fair..	8	" ..	4,160	83	18	35	"
41	Kendal Black.......	" 6	" 26	112	43	" ..	8	Sided.....	3,400	82	12	37	"
42	Olive White	" 6	" 26	112	45	" ..	8	"	3,660	80	20	38	"
43	Pense White..	" 6	" 26	112	47	Stiff..	9	"	2,680	80	...	38	None
44	Milford White......	" 6	" 26	112	47	" ..	9	"	2,760	77	22	37½	Slightly
45	Tartar King........	" 5	" 20	107	49	.	9	"	3,860	77	22	39	Considerably.

AVERAGE RESULTS OF A TEST OF SEVEN VARIETIES OF OATS FOR THE PAST SEVEN OR EIGHT YEARS.

Varieties.	Years Under Test.	Yield per Acre.	
		Bush.	Lbs.
American Beauty............	8	91	10
Mennonite..................	7	90	00
Banner.....................	8	88	29
Early Golden Prolific......	8	88	18
Bavarian...................	8	87	19
Holstein Prolific..........	8	86	56
Golden Giant...............	8	83	13

FIELD PLOTS OF OATS, 1903.

These were all sown on summer fallow with a drill, in the proportion of two bushels of seed per acre.

Variety.	Character of Soil.	Size of Field.	Date Sown.	Date Ripe.	Weight per Bushel.	Yield per Acre.	
					Lbs.	Bush.	Lbs.
Banner	Clay loam	7 acres	April 28	Aug. 15	37	83	15
Improved Ligowo	"	7 "	May 9	" 20	37	73	18
Tartar King	"	$6\frac{1}{2}$ "	" 1	" 17	$38\frac{1}{2}$	82	30
Waverley	"	5 "	" 8	" 28	38	86	05
Abundance	"	3 "	" 13	" 28	36	86	18

DIFFERENT METHODS OF PREPARING LAND FOR OATS.

Name of Variety.	Previous Crop.	Rust.	Date of Ripening.	Yield per Acre.		Weight per Bush.
				Bush.	Lbs.	Lbs.
Banner Oats	Flax	Little	Aug. 26	117	12	37
"	Millet	"	" 19	115	00	$37\frac{1}{2}$
"	Summer fallow	Bad	" 18	102	32	37
"	Turnips	Little	" 20	85	10	38

EXPERIMENTS WITH BARLEY.

The past season has been favourable for a heavy yield of barley, but the wet weather discoloured the sample. As nearly all the barley grown in this province is used for feed, the loss arising from discoloration was not serious.

Among the many varieties of barley grown on this farm, the Mensury is one of the best; the plant is vigorous and productive, the straw is stiff, and the head and kernels seldom fail to reach full development.

Twenty varieties of six-rowed barley were tested. The size of the plots used for this test was one-twentieth acre. The soil was a sandy loam which had been summer fallowed. All were sown on May 7 and 8, in the proportion of two bushels per acre. There was no rust on any of the plots.

BARLEY—SIX ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per bushel.
								lbs.	Bush.	lbs.	lbs.
1	Nugent..............	May 8..	Aug. 10..	94	34	Stiff......	4	3,540	73	4	48½
2	Mensury	" 7..	" 10..	95	41	"	3½	2,760	71	32	50
3	Yale................	" 8..	" 10..	94	38	"	3	4,440	70	..	48½
4	Summit..............	" 7..	" 13..	98	40	Fair	3	3,570	67	14	49
5	Brome...............	" 8..	" 11..	95	30	Weak . .	3	3,000	66	32	49½
6	Mansfield............	" 7..	" 11..	96	36	Stiff......	2¾	3,820	66	12	48
7	Odessa..............	" 8..	" 10..	84	35	Fair	3	3,820	66	12	48
8	Oderbruch............	" 7..	" 7..	92	33	Stiff......	3	2,860	63	16	51
9	Empire..........	" 8..	" 12..	96	66	Weak.....	3	3,140	61	32	48
10	Common..............	" 8..	" 7..	91	38	Stiff.....	3	3,440	61	32	46
11	Albert...............	" 8..	" 11..	95	34	"	3	3,380	58	36	48¼
12	Argyle..............	" 7..	" 10..	95	37	"	3	2,720	55	40	48½
13	Claude...............	" 8..	" 10..	94	33	"	2½	3,140	55	20	48½
14	Garfield.............	" 8..	" 10..	94	38	"	3½	3,540	55	20	46½
15	Rennie's Improved...	" 7..	" 7..	92	36	"	3	3,810	53	46	48½
16	Stella..............	" 8..	" 10..	94	30	"	3	4,410	53	46	48½
17	Trooper..............	" 7..	" 10..	95	35	"	3	4,240	53	16	47½
18	Royal................	" 7..	" 10..	95	38	"	3	3,160	50	40	48
19	Baxter.......... ...	" 8..	" 11..	95	38	"	2½	2,240	41	12	50
20	Champion............	" 8..	" 4..	88	39	"	3	2,840	32	24	47

AVERAGE RESULTS OF A TEST OF FOUR VARIETIES OF SIX-ROWED BARLEY FOR THE PAST SEVEN YEARS.

Varieties.	Number of Years under Test.	Yield per Acre.	
		Bush.	Lbs.
Mensury..	7 years	56	17
Nugent..	7 "	53	27
Trooper..	7 "	52	30
Summit..	7 "	52	24

BARLEY, TWO-ROWED—TEST OF VARIETIES.

The first sowing of two-rowed sorts of barley was made on May 8, but a very heavy fall of rain occurring before the plants were well rooted, a large portion of them in each plot were washed out, and a second sowing was made on June 5; these did not mature before severe frosts and the yield on this account was much smaller than the six-rowed varieties and the weight per bushel less.

Fifteen varieties of two-rowed barley were tested this season.

The plot of Newton barley was one-fortieth acre in size; all the others were one-twentieth acre.

The soil was a sandy loam which had been summer-fallowed; all were sown on June 8, in the proportion of two bushels of seed per acre.

BARLEY, TWO-ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Dunham	Sept. 15..	102	34	Stiff..	3	4,650	40	30	48	None.
2	Sidney	" 13..	100	34	" ..	4	3,410	39	18	47½	Slightly.
3	Logan	" 14..	101	36	" ..	3	3,790	37	34	47½	"
4	Harvey	" 13..	100	40	" ..	4	3,520	35	..	47½	None.
5	Fulton	" 14..	101	34	" ..	4	3,580	33	36	48	"
6	Newton	" 17..	104	34	" ..	6	4,400	33	16	47½	Slightly.
7	Invincible	" 14..	101	37	" ..	4	4,040	32	24	38	"
8	Beaver	" 17..	104	34	" ..	3½	3,460	32	4	46½	"
9	Standwell	" 19..	106	35	" ..	4	3,270	31	42	41	"
10	Clifford	" 18..	105	34	" ..	6	3,370	31	42	45	"
11	Jarvis	" 13..	100	38	" ..	5	4,730	30	30	50	None.
12	Gordon	" 18..	105	37	" ..	4	3,560	30	..	48	Slightly.
13	Danish Chevalier	" 18..	105	35	" ..	5	3,410	28	46	47	"
14	French Chevalier	" 18..	105	35	" ..	5	3,470	27	34	44½	"
15	Canadian Thorpe	" 15..	102	30	" ..	3	4,220	24	28	40	"

DIFFERENT METHODS OF PREPARING LAND FOR BARLEY.

Name of Variety.	Previous Crop.	Rust.	Date of Ripening.	Yield per Acre.		Weight per Bushel
				Bus.	Lbs.	Lbs.
Mensury—Barley (six-rowed)	Millet	None	Aug. 19..	67	4	48
" "	Summer-fallow	"	" 18..	62	4	48½
" "	Flax	"	" 26..	58	16	48
" "	Turnips	"	" 7..	47	4	48½

EXPERIMENTS WITH PEASE.

Forty varieties of pease were on trial this year, and the yield has been above the average.

Although some of the varieties were ripe a full month before they were harvested, there was scarcely any shelling and the sample was bright and heavy.

Pease are usually very productive here; the sample is bright and quite free from the attacks of pea wevil; the cost of harvesting and threshing is apparently the only drawback, and this can be largely overcome by sowing one or two pecks of oats per acre with the pease; the combined crop can then be cut with a binder, and threshed like other grain.

The size of the plots used for this test of varieties was one-twentieth acre. The soil was a clay loam, summer-fallowed. All were sown from April 25 to 29, in the proportion of two bushels of seed per acre for the small kinds and three bushels for the larger ones.

PEASE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
						in.	in.		Bush.	Lbs.	Lbs.
1	Alma..	Apr. 25..	Aug. 29..	126	Weak......	57	2	Small	64	40	62½
2	English Grey.......	" 25..	Sept. 1..	129	Medium..	35	2¼	"	63	..	61
3	Early Britain........	" 25..	Aug. 21..	118	Weak. ...	53	2½	Large	60	20	61¼
4	Macoun..............	" 25..	Sept. 1..	129	Medium..	67	3	"	57	..	62¼
5	Victoria.	" 25..	" 4..	132	Rank.....	55	3	"	54	40	62½
6	German White.......	" 25..	Aug. 29..	126	Medium..	55	2½	Small	54	40	63
7	Pearl................	" 27..	Sept. 3..	129	Rank.....	45	2½	Medium..	54	..	63¼
8	Golden Vine........	" 27..	Aug. 25..	120	Fair......	46	2	Small	53	40	62½
9	Crown...............	" 27..	" 22..	117	"	47	2	"	53	..	62
10	Archer.............	" 27..	Sept. 1..	127	Medium..	50	2½	Medium..	51	40	62½
11	Mackay..............	" 27..	" 1..	127	Fair......	53	2½	Large	50	20	63
12	Pride................	" 27..	Aug. 29..	124	Weak	53	2½	Med'um..	50	..	62¾
13	Wisconsin Blue......	" 27..	" 30..	122	Rank.....	48	3	Small ...	50	..	62½
14	Trilby	" 27..	Sept. 2..	128	"	60	2½	"	49	40	62¼
15	Black-eyed Marrowfat	" 24..	" 1..	130	Weak ...	55	2	Large ...	48	..	63¼
16	White Wonder..	" 25..	Aug. 19..	116	"	29	2½	Medium..	47	20	62½
17	King.........	" 27..	" 29..	124	Rank.....	54	2	" ..	47	..	63
18	Prince Albert	" 25..	" 27..	129	Fair......	56	2½	Small	47	..	62
19	Arthur...............	" 25..	" 27..	124	Weak	37	3	Large	46	40	63
20	Picton...............	" 25..	" 29..	126	Fair..	48	3	"	46	40	63
21	Kent	" 25..	Sept. 1..	129	Rank.....	41	2½	" ...	45	20	63½
22	Mummy	" 27..	Aug. 29..	124	Fair......	45	2	Small	45	20	63
23	Nelson...............	" 27..	" 26..	121	"	43	2	"	44	..	62½
24	Large White Marowf't	" 24..	" 30..	128	Rank.....	58	3	Large	43	40	63½
25	Fergus	" 25..	Sept. 2..	130	" ...	55	3	Small	43	20	61½
26	Elliot...............	" 27..	" 1..	127	"	60	3	Large	43	20	63
27	Agnes...............	" 25..	Aug. 28..	125	Weak	41	3	"	43	..	63¼
28	Chancellor	" 27..	" 20..	115	Fair......	44	2	Small	41	40	62½
29	Daniel O'Rourke.....	" 27..	" 29..	124	Medium..	65	3	Medium..	41	..	61½
30	Paragon.............	" 25..	Sept. 1..	129	Fair......	43	2	Small	38	40	62½
31	Prince...............	" 25..	" 1..	129	"	55	2½	Medium..	37	..	63½
32	Perth.......... ...	" 25..	Aug. 27..	124	Weak.....	51	3½	Large ...	36	..	64
33	Duke	" 25..	Sept. 1..	129	Rank.....	70	3	"	34	20	62¾
34	Gregory.............	" 25..	Aug. 29..	126	"	52	3	Medium..	34	20	63
35	Prussian Blue........	" 25..	" 27..	124	" ...	56	2¾	" ..	34	..	63
36	Carleton	" 25..	Sept. 2..	130	"	54	2	" ..	33	40	63
37	New Potter..........	" 27..	Aug. 29..	124	Fair.. ...	48	2	" ..	31	40	62
38	Bruce.......	" 25..	Sept. 1..	129	"	47	3	Small	28	20	62¾
39	Centennial......	" 27..	" 1..	127	Rank.....	44	2½	Medium..	27	40	62
40	Lanark............ .	" 25..	" 1..	129	Medium..	38	3	Large	24	..	62½

FLAX—TEST OF VARIETIES.

The several varieties of flax tested last year were again sown this year.

Novarossick has again proved the most productive, closely followed by La Plata. Our common flax is very similar to the varieties from Russia, viz., Russian, Riga and St. Petersburg; but the other kinds given in the following table are quite distinct. La Plata is a late variety with wide-spreading branches, and unusually large seed; Novarossick is also a coarse plant, but ripens with common flax. Bombay is so short and unproductive that it is not worthy of cultivation.

The size of plots for this test was one-fortieth acre, and the soil was a clay loam which had been summer-fallowed except in the case of the last plot on the list.

FLAX—TEST OF VARIETIES.

Varieties.	Date Sown.	Date Ripe.	Length of Straw.	Yield per Acre.		Weight per Bushel.
			In.	Bush.	Lbs.	Lbs.
Novarossick	June 2	Aug. 25	25	26	44	55½
La Plata	" 2	Sept. 1	25	20	40	46
Common	" 2	Aug. 25	31	19	36	55½
Russian	" 2	" 25	26	18	32	55½
Riga	" 2	" 25	28	13	32	53½
St. Petersburg	" 2	" 25	31	12	28	54½
Bombay	" 2	" 28	15	8	32	53
Common on new breaking	" 2	Sept. 1	25	19	6	55

FLAX—THICK AND THIN SOWING.

Last year from 15 to 50 pounds of seed was used in this series of experiments, with the result that the yield increased in about the same ratio as the increase of seed.

This year much larger quantities of seed were used, but sixty pounds of seed gave a larger yield than any thicker sowing. The plots for this test were one-fortieth acre, and the soil a black loam, summer-fallowed.

All were harvested on September 3, 1903.

Varieties.	Amount sown per Acre.	Date of Sowing.	Length of Straw.	Yield per Acre.		Weight per Bushel.
	Lbs.		In.	Bush.	Lbs.	Lbs.
Common Flax	40	June 2	29	20	40	55
"	50	" 2	29	18	32	55
"	60	" 2	29	22	28	55
"	70	" 2	29	21	4	55
"	80	" 2	29	20	20	55
"	90	" 2	29	19	36	55
"	100	" 2	29	17	48	55

EXPERIMENTS WITH INDIAN CORN.

The crop of Indian corn was heavier than usual this year, some of the plants being twelve feet high; but owing to lack of sunshine during midsummer it was not as well matured as usual, only five out of about twenty-five varieties reaching the late milk stage.

In addition to the test plots a field of Pearce's Prolific was grown for feeding purposes. About seventy-five tons of this corn was harvested with a corn binder and made into ensilage; the remainder was stooked in the field and will be drawn in as it is required and fed dry.

The seed was sown on May 28, in rows 30 inches apart, using about half a bushel of seed per acre. The crop was cut on September 4. Twenty-five varieties were under trial, the soil was a black sandy loam, and the previous crop was corn. The yields were calculated from two rows each 66 feet long.

Indian Corn—Test of Varieties.

Number.	Name of Variety.	Height — Inches.	When Tasselled.	In Silk.	Condition when cut Sept. 2.	Weight per Acre grown in rows. Tons.	Lbs.	Weight per Acre grown in hills. Tons.	Lbs.
1	Eureka	132	Aug. 30	....	In tassel	28	1,532	22	1,672
2	Thoroughbred White Flint	100	" 26	....	"	28	232	21	1,032
3	Champion White Pearl	108	" 25	....	"	24	312	18	960
4	Superior Fodder	85	" 21	Aug. 30	In silk	21	1,824	20	1,712
5	Early Mastodon	108	" 20	" 30	"	21	768	21	1,032
6	Compton's Early	116	" 20	" 22	Early milk	20	392	17	1,112
7	Early Butler	120	" 24	....	In tassel	19	1,336	17	320
8	Red Cob Ensilage	108	" 26	....	"	19	1,072	22	1,672
9	Mammoth Cuban	144	" 22	Sept. 1	In silk	19	1,072	18	432
10	Angel of Midnight	97	" 18	Aug. 24	Early milk	19	1,072	16	1,792
11	Giant Prolific Ensilage	110	" 26	....	In tassel	19	280	16	472
12	Longfellow	100	" 11	Aug. 20	Early milk	19	280	19	16
13	King Philip	96	" 19	" 25	Late milk	18	1,752	16	1,528
14	White Cap Yellow Dent	100	" 22	" 26	Early milk	18	1,752	15	1,680
15	North Dakota White	110	" 12	" 20	Late milk	18	960	16	1,528
16	Selected Leaming	109	" 24	" 30	In silk	18	432	15	1,680
17	Sanford	85	" 18	" 21	Late milk	16	1,000	15	1,680
18	Cloud's Early Yellow	120	" 23	" 30	In silk	16	472	13	1,192
19	Squaw Corn	91	" 18	" 22	Late milk	15	1,944	18	960
20	Evergreen Sugar	90	" 25	....	In tassel	15	1,680	13	400
21	Pride of the North	114	" 20	Aug. 27	Early milk	15	1,680	15	360
22	Mammoth 8-rowed Flint	106	" 15	" 25	Late milk	15	1,152	14	1,832
23	King of the Earliest	96	" 21	" 31	In silk	15	360	16	472
24	Salzer's All Gold	107	" 22	" 30	"	14	248	22	352
25	North Dakota Yellow Flint	95	" 11	" 20	Early milk	11	1,760	14	248

INDIAN CORN—SOWN AT DIFFERENT DISTANCES APART.

Name of Variety.	Distance apart. Inches.	Height. Inches.	Condition when cut.	Weight per Acre, cut green for ensilage, in rows. Tons.	Lbs.
Longfellow	24	114	Late milk	18	300
"	30	114	"	14	1,832
"	36	114	"	15	800
"	42	114	"	11	275
Selected Leaming	24	120	In silk	19	1,600
" "	30	120	"	17	320
" "	36	120	"	18	960
" "	42	120	"	12	750
Champion White Pearl	24	116	"	21	900
" "	30	116	"	20	1,712
" "	36	116	"	19	1,600
" "	42	116	"	13	895

INDIAN CORN.

Average Yield at Different Distances Apart.	Tons.	Lbs.
Average yield of green corn at 24 inches apart	19	1,600
" " 30 "	17	1,288
" " 36 "	17	1,786
" " 42 "	12	640

POP-CORN.

Two varieties of pop-corn were grown, but neither of them matured grain before the frost. They were sown on June 3, and cut September 3.

The Early Amber Rice pop-corn reached the early milk stage, was 75 inches high, and yielded 14 tons 1,600 pounds of green fodder per acre.

The White Pearl pop-corn was only in silk when cut, and 80 inches high. It yielded 18 tons of green fodder per acre.

The size of each plot was one-twentieth acre, and the soil sandy loam, summer-fallowed.

EXPERIMENTS WITH TURNIPS.

Twenty varieties of turnips have been on trial at the experimental farm this year. The yield was much above the average, and the quality excellent.

The soil chosen for this experiment was a sandy loam, and the previous crop potatoes. Ten loads of well rotted manure per acre were applied in the autumn of 1902, and ploughed under at once.

Two sowings were made of each variety; in every instance the early sown plots gave the largest return; in some instances the early sown plots yielded twice as much as the late sown ones.

The first plots were sown on May 30, the second on June 13, and the roots from both were pulled on October 7. The estimate of yield has been made from the product of two rows, each 66 feet long.

TURNIPS.—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Growth.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
			Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Magnum Bonum	Strong	43	1,120	1,452	..	18	960	616	..
2	Drummond Purple Top	"	42	480	1,408	..	14	1,040	484	..
3	Mammoth Clyde	Weak	41	1,160	1,386	..	16	1,000	550	..
4	Elephants Master	Fair	40	1,312	1,355	12	15	1,680	528	..
5	Selected Purple Top	Strong	40	520	1,342	..	16	736	545	36
6	Skirvings	"	40	520	1,342	..	20	920	682	..
7	Imperial Swede	Fair	40	520	1,342	..	19	1,600	660	..
8	Kangaroo	Strong	39	1,200	1,320	..	17	320	572	..
9	Sutton's Champion	Fair	39	1,200	1,320	..	15	360	506	..
10	Hall's Westbury	Strong	39	1,200	1,320	..	21	240	704	..
11	New Century	"	39	672	1,311	12	14	1,040	484	..
12	Halewood's Bronze Top	"	38	1,880	1,298	..	17	320	572	..
13	Emperor Swede	Fair	38	560	1,276	..	14	1,568	492	48
14	Hartley's Bronze	"	38	560	1,276	..	22	880	748	..
15	East Lothian	Strong	36	1,920	1,232	..	15	1,680	528	..
16	Good Luck	Fair	36	864	1,214	24	14	1,040	484	..
17	Shamrock Purple Top	"	36	600	1,210	..	19	280	638	..
18	Perfection Swede	Weak	35	1,280	1,188	..	16	1,000	550	..
16	Bangholm Selected	Fair	34	1,960	1,166	..	15	360	506	..
20	Jumbo	Strong	32	680	1,078	..	16	1,000	550	..

EXPERIMENTS WITH MANGELS.

Sixteen varieties of these useful field roots were tested this year; the yield was above the average and the quality good.

Mangels are found to be one of the most serviceable field roots grown on the farm; all animals are partial to them, even chickens will consume a large quantity of them during the winter months.

About the only objection to their cultivation is the risk from injury from early fall frosts.

The soil chosen for this crop was a sandy loam fertilized the previous year with ten loads per acre of barn-yard manure; the previous crop was potatoes.

The first plots were sown on May 30, and the second on June 13; all were harvested on September 21.

The estimate of yield has been made from the product of two rows, each 66 feet long.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.—1st Plot.		Yield per Acre.—1st Plot.		Yield per Acre.—2nd Plot.		Yield per Acre.—2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth Long Red	42	744	1,412	24	23	1,520	792	..
2	Half Long Sugar White	36	1,392	1,223	12	28	760	946	..
3	Triumph Yellow Globe	36	1,584	1,126	24	20	656	677	36
4	Mammoth Yellow Intermediate	33	1,320	1,122	..	24	1,368	822	48
5	Selected Mammoth Long Red	32	1,736	1,095	36	23	1,784	796	24
6	Prize Mammoth Long Red	32	1,472	1,091	12	22	88	734	48
7	Prize Winner Yellow Globe	31	1,360	1,056	..	21	1,560	726	..
8	Yellow Intermediate	30	720	1,012	..	20	712	695	12
9	Lion Yellow Intermediate	29	1,400	990	..	22	880	748	..
10	Leviathan Long Red	28	232	937	12	18	960	616	..
11	Gate Post	27	1,968	932	48	23	200	770	..
12	Selected Yellow Globe	27	1,704	928	24	23	728	778	48
13	Giant Sugar Mangel	27	912	915	12	20	1,712	695	12
14	Half Long Sugar Rosy	27	912	915	12	20	1,712	695	12
15	Giant Yellow Globe	25	1,480	858	..	21	1,560	726	..
16	Giant Yellow Intermediate	25	160	836	..	23	992	783	12

EXPERIMENTS WITH CARROTS.

The soil selected for this crop was not a suitable one, being too stiff and hard, giving the roots little opportunity of penetrating it.

Eleven varieties were tried; the first sowing was made on May 16 and the second on June 6. With one exception, all the first sown plots gave the largest yield.

The soil was a stiff clay loam, which had been summer-fallowed; all were pulled on October 19.

The yield per acre has been calculated from the product of two rows, each 66 feet long

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Improved Short White	22	1,320	755	20	12	640	410	40
2	New White Intermediate	21	240	704	..	10	900	348	20
3	Ontario Champion	21	240	704	..	11	1,760	396	..
4	White Belgian	17	1,640	594	..	10	1,780	363	..
5	Half Long Chantenay	17	320	572	..	10	1,120	352	..
6	Half Long White	16	1,440	557	20	8	720	278	40
7	Giant White Vosges	15	1,680	528	..	12	1,300	421	40
8	Mammoth White Intermediate	14	1,700	495	..	8	60	267	40
9	Early Gem	14	600	443	20	11	1,320	388	40
10	Carter's Orange Giant	11	880	381	20	9	1,800	330	..
11	Long Yellow Stump Rooted	10	900	348	20	11	1,320	338	40

EXPERIMENTS WITH SUGAR BEETS.

Eight varieties of sugar beets were on trial this year; the soil was a sandy loam, on which a crop of potatoes was grown in 1902; the soil was fertilized with ten loads per acre of barn-yard manure in the fall of 1902.

The first plots were sown on June 1, and the second on June 15. All were pulled September 21.

The yield has been calculated from two rows, each 66 feet long.

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Danish Red Top	25	160	836	..	19	1,660	660	..
2	Red Top Sugar	24	312	805	12	20	920	682	..
3	Danish Improved	23	464	774	24	16	1,000	550	..
4	Improved Imperial	22	1,936	765	36	21	504	708	24
5	Wanzleben	20	128	668	48	15	360	506	..
6	Royal Giant	19	1,600	660	..	21	504	708	24
7	French "Very Rich"	13	1,720	462	..	13	1,720	462	..
8	Vilmorin's Improved	13	1,456	457	36	14	776	479	36

EXPERIMENTS WITH POTATOES.

Fifty-six varieties of potatoes were under trial this year; the season was a favourable one. The yield was large and the quality excellent.

On this farm the following system of cultivation has given excellent yields of potatoes, with the minimum amount of labour, and leaves the field to a large extent free of weeds.

Stubble land is ploughed deep and as early in spring as possible; this is harrowed at once, and again as the weeds germinate, until about May 20, when the field is rolled and ploughed shallow, the potatoes being planted in every third furrow. The land is then harrowed every few days until the potato plants are three inches high; by this plan little or no hoeing is necessary, and good yields are assured.

The soil selected this year was a stiff clay loam, and the previous crop was mangels. The potatoes were planted on May 21 and dug October 16 and 17. There was no injury from rot; the yield has been estimated in each case from the product of one row 66 feet long.

POTATOES—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Growth.	Average Size.	Total yield per acre.		Yield per acre of Marketable.		Yield per acre of unmarketable.		Form and Colour.
				Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	General Gordon	Rank	Medium to large.	630	40	539	..	91	40	Long round deep pink
2	Delaware	V. rank.	" "	586	40	535	20	51	20	Long, oval, white.
3	Enormous	"	Medium	509	40	440	..	69	40	Roundish, white.
4	Uncle Sam	"	Medium to large	498	40	462	..	36	40	Flattish, oval, white.
5	American Wonder	"	Large	495	..	462	..	33	..	Long, round, white.
6	Seedling No. 7	"	Medium to large	487	40	439	..	58	40	Long, deep red.
7	Irish Daisy	Fair	" "	484	..	432	40	51	20	Long, oval, white.
8	State of Maine	Rank	Small to medium	484	..	432	40	51	20	Flat, oval, white.
9	Money Maker	Fair	" "	480	20	429	..	51	20	Round, oval, white.
10	Canadian Beauty	Rank	Medium to large	469	20	436	20	33	..	Long, round, l't pink.
11	Cambridge Russet	Fair	" "	465	40	429	..	36	40	" " dp russet
12	Early Puritan	Rank	" "	462	..	429	..	33	..	" " white.
13	Early Norther	Fair	" "	462	..	403	20	58	40	" flat, pink.
14	Green Mountain	Rank	Small to medium	451	..	414	20	36	40	Flat, oval, white.
15	Reeve's Rose	"	Medium to large	451	..	432	40	18	20	Flat, oval, light pink.
16	Empire State	"	" "	451	..	429	..	22	..	Long, white.
17	Brown's Rot Proof	Fair	" "	447	20	414	20	33	..	Round oval deep pink
18	Country Gentlemen	"	" "	447	20	407	..	40	20	Long, deep pink.
19	Irish Cobbler	"	" "	447	20	392	20	55	..	Flat, white.
20	Everett	Rank	" "	447	20	407	..	40	20	Long, oval, pink.
21	Rose of the North	"	" "	440	..	403	20	36	40	Round, oval, l't pink.
22	Rawdon Rose	Fair	Small to medium	440	..	399	40	40	20	" " "
23	Maule's Thor'ghbred	Rank	Medium to large	440	..	344	40	95	20	Long, deep, pink.
24	Holborn Abundance	"	" "	436	20	418	..	18	20	Round, white.
25	Lee's Favourite	Weak	Small to medium	432	40	392	20	40	20	Long, oval, light pink
26	Late Puritan	Rank	Medium to large	430	50	388	40	42	10	Long, round, white.
27	Rose No. 9	"	" "	429	..	396	..	33	..	Long, flat, deep pink
28	Burnaby Seedling	"	" "	429	..	414	20	14	40	Flat, oval, pink.
29	Sharpe's Seedling	Fair	" "	425	20	381	20	44	..	Long, oval, l't pink.
30	Vanier	Rank	Small to medium	425	20	385	..	40	20	Round, oval, pink.
31	Early White Prize	Fair	Medium to large	418	..	385	..	33	..	Round, oval, l't pink
32	Prolific Rose	"	" "	418	..	396	..	22	..	Round, deep pink.
33	Swiss Snowflake	Rank	Small to medium	414	20	396	..	18	20	Irregular, white.
34	American Giant	"	Medium to large	414	20	381	20	33	..	Round, oval, white.
35	Dreer's Standard	"	" "	414	20	381	20	33	..	Flattish, oval, white.
36	I. X. L.	"	" "	414	20	377	40	36	40	Long, round, pink.
37	Early Michigan	Fair	" "	410	40	366	40	44	..	Long, white.
38	Penn Manor	Rank	" "	407	..	355	40	51	20	Long, oval, deep pink
39	Pearce	"	" "	407	..	374	..	33	..	Round, pink.
40	Carman, No. 1	Fair	" "	399	40	370	20	29	20	Flat, white.
41	McIntyre	Rank	" "	388	40	363	..	25	40	Long, round, white.
42	Carman No. 3	Fair	" "	381	20	348	20	33	..	" " "
43	Early Sunrise	"	Large	377	40	341	..	36	40	Long, oval, l't pink.
44	Troy Seedling	Rank	Small to medium	377	40	355	40	22	..	Irregular, white.
45	Sabean's Elephant	"	Medium to large	366	40	341	..	25	40	Long, round, white.
46	Early Andes	Fair	Small to medium	363	..	330	..	33	..	Round, oval, white.
47	Clay Rose	Rank	Medium to large	355	40	308	..	47	40	Flat, oval, deep pink
48	Rochester Rose	Weak	Small to medium	341	..	308	..	33	..	Long, round, l't pink
49	Early Rose	Fair	" "	335	30	251	10	84	20	Round, pink.
50	Early St. George	"	Medium to large	330	..	297	..	33	..	Long, oval, deep pink
51	Bovee	"	" "	319	..	282	20	36	40	Long, oval, l't pink.
52	Vicks Extra Early	"	Small to medium	315	20	289	40	25	40	Flat, pink.
53	Burpee's Extra Early	Weak	Medium to large	311	40	297	..	14	40	Oval pink.
54	Early Envoy	Fair	" "	271	20	253	..	18	20	Round pink.
55	Up To Date	Rank	Small to medium	258	30	232	50	25	40	Flat, white.
56	Pingree	Weak	" "	113	40	106	20	7	20	Flat, oval, white.

GRASSES.

Owing to the very dry weather in June, the yield of grasses is below the average this year.

A new variety, *Bromus Arvensis,* was on trial for the first time this year. It is a biennial with a very handsome panicle; its suitability for feeding purposes has not yet been tested on this farm. The grasses were sown on spring-ploughed stubble, without a nurse crop. Size of plots, one-twentieth acre; soil, a sandy loam.

Varieties.	When sown.	Seed per Acre.	Yield of Hay per Acre.	
		Lbs.	Tons.	Lbs.
Austrian Brome (*Bromus inermis*)	1900	12	2	——
" " (" ")	1902	12	1	300
Field Brome (*Bromus Arvensis*)	1902	12	1	900
Hard Fescue	1900	10	1	1,850
Western Rye Grass (*A. tenerum*)	1902	12	1	220
Wheat Grass (*E. Virginicus*)	1902	12	—	1,500

EXPERIMENTS WITH CLOVERS.

As usual, a number of the hardiest clovers have wintered here, and given a fair return of fodder. The plan usually followed in the eastern provinces of sowing clover seed with a nurse crop of grain has always proved a failure on this farm, our heavy crops of grain so completely shade the ground that the clover plant has no opportunity of developing and is too small and weak to withstand the severe winter.

The system adopted here is to plough grain stubble land late in May or early in June, harrow once, sow the clover seed broadcast, then harrow a second time and roll, when the weeds and volunteer crop is about one foot high a mower is run over the land and the cuttings left on the ground as a mulch. By autumn the clover plants are, by this plan, commonly about two feet high, well rooted, and they usually pass the winter without loss.

Red Clover will give a paying crop for about three years without resowing. Alfalfa can be cut twice in a season but the other clovers only once.

Crimson Clover has been found too tender for this climate. Sweet or Bokhara Clover is hardy and a rank grower, but the plant is of little use for fodder purposes.

Test of varieties sown May, 1902, on spring ploughed wheat stubble, size of plots one-twentieth acre, soil sandy loam.

Varieties.	Seed per Acre.	Aftermath thickness.	Yield of Hay per Acre.	
	Lbs.		Tons.	Lbs.
Mammoth Red	20	Fair	2	700
Common Red	20	Thick	1	1,600
Alfalfa, 1st cutting	25	"	2	1,000
" 2nd "	25	"	1	500
Alsike	20	Thin		1,800
White Dutch	20	Very thin	Not weighed	

MILLETS.

Under proper treatment several varieties of millet have proved very satisfactory on this farm. The early maturing and finer strawed kinds have been the most successful, such as Common Millet, Hungarian Grass, German Millet and Golden Millet.

Common Millet is the only variety that will ripen its seed here every year. Much of the imported seed is mixed with the seed of wild mustard, but if a small plot is sown with the imported seed and the noxious weeds pulled by hand, pure seed can be obtained for future use. It has not been found advisable to feed millet in large quantities to horses, but during the past winter the work horses on this farm were each fed one sheaf of common millet each day, with excellent results. For this purpose the crop should be cut directly it is in the head, and before the seed has fully formed.

Millet seed is small and the germ rather feeble, and for that reason it should be sown only in well pulverized and moist loam; hard clay, gumbo, dry sandy or gravelly soils are not suitable for it.

Summer-fallowed land or the first crop after field roots makes a good preparation for Millets, and from May 20 to June 15 is the proper time to sow them.

The size of the plots for this test were one-fortieth acre and the soil was a rich sandy loam which had been summer-fallowed; all were sown on June 3 and cut on September 3.

MILLETS.

Varieties.	Height.	Length of Head.	Stage when Cut.	Yield per Acre of Hay.	
	Inches.	Inches.	—	Tons.	Lbs.
Algerian or Early Pearl	75	5	Fully headed	5	1,600
Moha Hungarian	45	5	"	5	600
Italian or Indian	43	None.	Not headed	4	1,000
Round French	63	8	Nearly ripe	3	600
Pearl or Cat-tail	30	None.	Not headed	3	400
Common Millet	39	4	Nearly ripe	2	800
Red Orenburg	47	6	Fully headed	2	600

HORSE BEANS AND SUNFLOWERS.

A one-twentieth acre plot of each of these plants were grown, but the frost of September 3 and 4 injured them so severely that they were not worth cutting.

CATTLE.

The herd of cattle on the Brandon experimental farm now consists of the following animals:—

Name of Animal.	Breed.	Age.	Weight.
			Lbs.
Red Knight of Brandon	Shorthorn	19 months	1,210
Brandon Myrtle	"	4 years	1,595
Nancy	"	3 "	1,240
Alice May	"	3 "	1,420
Rose of Brandon	"	5 months	465
Haron	Ayrshire	7 "	550
Lily of Brandon	"	19 "	865
Denty	"	19 "	760
Ottawa Prince	Guernsey	21 "	1,090
Brandon's Maid	"	2 years	965
Christie	Shorthorn-grade	6 "	1,365
Gretchen	"	5 "	1,355
Carrie	"	8 "	1,420
Jennette	"	7 "	1,290
Jenny	"	3 months	270
Pet	Ayrshire-grade	6 years	925
Sis	"	5 months	370

EXPERIMENTS IN FEEDING STEERS.

BROME GRASS COMPARED WITH FODDER CORN.

Of the ten steers selected for this test, two were Aberdeen Angus grades, and the balance Shorthorn grades; all were two and one-half years old when the test began.

When purchased in November, 1902, the steers cost $3.50 per hundred pounds live weight, and they sold in April, 1903, for $4.25 per hundred; both lots were then choice export cattle.

After two weeks of preparatory feeding, they were divided into two uniform groups. All were tied in double stalls and fed all they would eat of the following rations:—

Ration fed Group No. 1.

During the first four weeks, December 12, 1902, to January 9, 1903, each steer received per day—

	Pounds.
Brome hay	20
Turnips	10
Chop	6
Bran	5

During the second four weeks, January 9 to February 6, 1903, each steer received per day—

	Pounds.
Brome hay	20
Turnips	7
Chop	7
Bran	5

During the third four weeks, February 6 to March 6, 1903, each steer received per day—

	Pounds.
Brome hay	20
Turnips	7
Chop	8
Bran	5

During the fourth four weeks, March 6 to April 3, 1903, each steer received per day—

	Pounds.
Brome hay	20
Turnips	7
Chop	9
Bran	5

Ration fed Group No. 2.

During the first four weeks, December 12, 1902, to January 9, 1903, each steer received per day—

	Pounds.
Fodder corn	24
Turnips	10
Chop	6
Bran	5

During the second four weeks, January 9, to February 6, 1903, each steer received per day—

	Pounds.
Fodder corn	26
Turnips	7
Chop	7
Bran	5

During the third four weeks, February 6 to March 6, 1903, each steer received per day—

	Pounds.
Fodder corn	30
Turnips	10
Chop	8
Bran	5

During the fourth four weeks, March 6, to April 3, 1903, each steer received per day—

	Pounds.
Fodder corn	30
Turnips	10
Chop	9
Bran	5

DESCRIPTION OF FODDER.

The brome was cut early and well cured.

The fodder corn was Pearce's Prolific, cut when in the late milk stage, well cured in the stooks outside and only drawn in as it was wanted. The chop consisted of one-third each of wheat screenings, oats and barley.

COMPARATIVE GAINS.

Brome Grass Hay.	Date.	Weight.	Gain.	Total Gain.
Original weight of steers	Dec. 12, 1902	6,030 lbs		
Weight at end of 1st period	Jan. 9, 1903	6,205 "	175 lbs	
" 2nd "	Feb. 6, 1903	6,490 "	285 "	
" 3rd "	March 6, 1903	6,810 "	320 "	
" 4th "	April 3, 1903	6,965 "	155 "	935 lbs.

Fodder Corn.	Date.	Weight.	Gain.	Total Gain
Original weight of steers	Dec. 12, 1902	6,000 lbs		
Weight at end of 1st period	Jan. 9, 1903	6,210 "	210 lbs	
" 2nd "	Feb. 6, 1903	6,505 "	295 "	
" 3rd "	March 6, 1903	6,810 "	305 "	
" 4th "	April 3, 1903	7,010 "	200 "	1,010 lbs.

COST OF FEEDING.

Lot No. 1.—Brome Grass Hay.

11,200 pounds of hay at $5 per ton	$28 00
79⅓ bushels of turnips at 5c. per bushel	3 96
4,200 pounds of chop at 75c. per 100 pounds	31 50
2,800 pounds of bran at $12 per ton	16 80
Total cost of five steers	$80 26
Cost of one steer	$16 05

Lot No. 2.—Fodder Corn.

16,050 pounds of fodder corn at $4 per ton	$32 10
79⅓ bushels of turnips at 5c. per bushel	3 96
4,200 pounds of chop at 75c. per 100 pounds	31 50
2,800 pounds of bran at $12 per ton	16 80
Total cost for five steers	$84 36
Cost for one steer	$16 87

SUMMARY OF RESULTS.

—	First Cost per Steer.	Value of Feed consumed.	Price per Steer sold for.	Gain per day.	Profit per Steer.
	$ cts.	$ cts.	$ cts.	Lbs. oz.	$ cts.
Fed Brome Grass Hay	42 51	16 05	59 20	1 10	0 64
Fed Fodder Corn	42 00	16 87	59 58	1 12	0 71

CONCLUSIONS.

The results of this experiment would lead us to the following conclusions:—

First, that there is very little profit in feeding steers when the difference between the buying and selling price is only about 75 cents per steer.

Second, that cattle require more pounds of fodder corn per day than they do of brome grass hay.

Third, that the comparative value of these two fodder crops is about $4 per ton for fodder corn and $5 for brome hay.

EXPERIMENTS WITH SWINE.

SPELTZ (EMMER) COMPARED WITH MIXED GRAIN.

The area sown with speltz in this province has increased very largely during the past year, but very little is known of its value as a pig feed.

Eight pigs were used for this test, two Yorkshires and two Berkshires in each group.

The mixed grain used was composed of one-fifth oats, two-fifths wheat screenings, and two-fifths barley; both it and the speltz were ground and fed.

Both kinds of feed were valued at 75c. per hundred pounds. Reports have been received of injury to young pigs from feeding speltz, but no difficulty was experienced from this cause here.

At the close of the test the pigs were sold at $5.25 per hundred pounds, live weight.

RATION FED.

Amount and value of food consumed during the fattening term of 81 days from January 15 to April 9, 1903 :—

——	Grain fed.	Value of feed.
	Lbs.	$ cts.
Pen 1, fed speltz	1,525	11 43
Pen 2, fed mixed grain	1,550	11 62

SUMMARY.

——	Weight when bought.	Value when bought.	Weight when sold.	Value when sold.	Value of food.	Profit on each pen.
	Lbs.	$ cts.	Lbs.	$ cts.	$ cts.	$ cts.
Pen 1, fed speltz	432	22 68	821	43 10	11 43	8 99
Pen 2, fed mixed grain	402	21 10	809	42 47	11 62	9 75

CONCLUSIONS.

First, the pen of animals fed on mixed grain consumed 25 pounds more grain during the fattening period than those fed on speltz.

Second, the same pen also made a gain of 18 pounds more than those fed on speltz.

Third, the amount of profit was practically the same from each class of food, the difference being only 76c. per pen in favour of the mixed grain ration.

POULTRY.

Three breeds of poultry have been kept on this farm during the year, namely, Barred Plymouth Rocks, White Wyandottes and Light Brahmas. All have kept quite healthy and seventy-three chicks were raised during the summer.

INCUBATOR.

A trial was made this year with an incubator, as this is the first year it has been tried on the farm, and the operator inexeprienced, it was deemed advisable to await the results of another year's test before reporting on its success.

FATTENING OF BARRED PLYMOUTH ROCKS COMPARED WITH WHITE WYANDOTTES.

Four Barred Plymouth Rock cockerels and an equal number of White Wyandottes were shut up in slatted pens each 2 x 3 feet, and fed all they would eat of finely ground grain consisting of one-third each of wheat, oats and barley. This was given in troughs mixed with skim-milk to the consistency of thin porridge.

In the following tables the meal has been estimated at 75 cents per hundred pounds. The fattening period covered 28 days.

Barred Plymouth Rocks.

Weight Nov. 25.		Weight Dec. 23.		Gain.		Cost of food.		Cost per lb. live weight.
Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	$	cts	cts.
19	00	24	8	5	8	0	22	4

Wyandottes (white).

Weight Nov. 25.		Weight Dec. 23.		Gain.		Cost of food.		Cost per lb. live weight.
Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	$	cts.	cts.
17	10	21	10	4	00	0	21	5¼

SUMMARY.

First. The pen of Barred Plymouth Rocks consumed one and one-half pounds more grain during the fattening period than the White Wyandottes.

Second. The Barred Plymouth Rocks gained one and one-half pounds more flesh during the month, and the cost of the added flesh was one and one-quarter cents per pound less than in the case of the White Wyandottes.

BEES.

The colonies of bees were removed from the cellar to their summer stands on April 4, ten days earlier than usual; of the twelve hives placed in the cellar last fall one died from inadequate stores.

A large number of farmers in this province are starting in bee-keeping.

For this reason the apiary was run for swarms more than for honey and still the demands for colonies could not be met. Some of the colonies were shipped long distances; this gave opportunity for the testing of different ways of packing hives for shipment; some of the plans tried proved disastrous to both comb and bees.

The most successful shipping was accomplished with the Langstroth hive, as follows: The reversible bottom board is placed so as to give the largest possible entrance which, with this hive is seven-eighth inches. This entrance is then covered with mosquito wire netting. A piece of comb section is placed on each corner of the hive body just under the cover; this raises the cover just enough to permit of ventilation, but not enough to allow the escape of bees. Malleable bale wire is then wrapped around the hive and twisted tight to keep the cover and bottom board firmly attached to the hive. By the above plan colonies have invariably reached their destination safely.

A trial was made this year of growing two different plants, as bee food, namely, Sweet Clover (Melitotus Alba) and Borage, the sweet clover is a biennial, and during the second summer blooms freely and continuously until frost. Bees are very partial to it, and the yield of nectar is large.

Borage is an annual garden herb, with bright blue flowers, which are very abundant throughout the summer. The plot of one-twentieth acre grown on the farm this year was fairly swarming with bees every bright day, and apparently the yield of honey from it is considerable.

Thirteen colonies were placed in the cellar on November 13, 1903.

HORTICULTURE.

The season of 1903 was a very favourable one from a horticultural standpoint. The total absence of spring frosts contributed to a very heavy setting of fruits, and the generous rains throughout the season materially assisted in producing one of the best crops of fruit and vegetables of recent years.

A very large crop of crab-apples and plums were harvested, the yield from these being one of the heaviest recorded on the experimental farm; while raspberries and currants also gave fair returns.

The vegetable garden was very satisfactory, all varieties giving an exceptionally heavy yield of excellent quality.

Only one serious check was experienced during the season and this, fortunately, was near the close. On September 12, we were visited by a severe snow storm, accompanied by much wind, after which the thermometer registered 10° of frost, which damaged the late ripening vegetables as well as the later ripening varieties of cross-bred apples.

The bright weather experienced during the spring months was very favourable to hot-bed work, and exceptionally strong flowering plants were available at transplanting time, the flower garden presenting a mass of colour throughout the season.

Following will be found the results of portions of the work undertaken in this department.

STANDARD APPLES.

The following standard apples grafted on Pyrus baccata, together with some Russian seedlings, were received from the Central Experimental Farm at Ottawa and planted here during the past season:—

Hibernal.
Wealthy.
North-west Greening.
McMahon White.
Longfield.
Russian Seedling, No. 18.
Russian Seedling, No. 22.
Russian Seedling, No. 7.
Russian Seedling, No. 3.
Russian Seedling, No. 26.
Yellow Transparent.
Pointed Pipka.
Duchess of Oldenburgh.
Scott's Winter.
McIntosh Red.

All became well established before the winter set in.

APPLES (PYRUS BACCATA).

Although a heavy crop of fruit of the several varieties of Pyrus baccata was harvested last year, we were again favoured with an enormous crop during the present season. Of these the largest were the Pyrus baccata sanguinea, Pyrus baccata xanthocarpa, Pyrus baccata yellow, Pyrus —— No. 529. These made excellent preserves when cooked whole, while the smaller ones were unexcelled for jelly.

SEEDLINGS OF THE MARTHA CRAB.

A considerable number of these seedlings fruited for the first time this season, among which were some excellent varieties. The best of these will be propagated for distribution by grafting on roots of Pyrus baccata.

GRAFTING

In the spring of 1902, scions of the following varieties were grafted on Pyrus baccata:—

Transcendent.
Pride of Minneapolis.
Wealthy.
Duchess of Oldenburgh.

Excellent unions were made in all cases, and the following shows the condition of the scions after having passed through one winter.

Transcendent.—100 per cent alive to tips.
Pride of Minneapolis.—100 per cent alive to tips.
Wealthy.—All killed back three-fourths.

Duchess.—50 per cent killed back three-fourths. Balance alive to tips.

The scions that came through in good condition made splendid growth during the present season, and their condition will be reported upon next year. In connection with the Duchess of Oldenburgh, we desire to state, that the percentage of scions of this variety which wintered successfully, was greatly reduced by reason of the fact that two of the *Pyrus baccata* on which these were grafted, afterwards died and were destroyed.

ROOT GRAFTING.

A number of root grafts were made on *Pyrus baccata* with scions taken from the surviving trees of the old apple orchard. These made good unions, and successfully passed through the winter of 1902-03. They were planted in the *Pyrus* orchard this spring and made good growth during the season.

TOP GRAFTING.

Scions of the following were received from the Central Experimental Farm and top grafted on *Pyrus baccata* during the past spring:—

Yellow Transparent.
McMahon White.
Hibernal.
Duchess of Oldenburgh,
Malinda.
Wealthy.
Patten's Greening.
Charlamoff.
North-western Greening.

In addition to these a few scions were received from Miss Fowler, of Headingly, Manitoba, of an unnamed red apple. The following named cross-bred apple scions were received from the Central Experimental Farm, Ottawa:—

Charles, Pioneer, Northern Queen,
Carleton, Ruby, Aurora, Derby.

There were no cases of failure to unite, and a good growth was made during the season.

CROSS-BRED APPLES.

A large number of cross-bred apples fruited for the first time this season, and though none of the named varieties were included, some very fair samples were noted. The most satisfactory of these will be found under the heading of 'Descriptive list of apples.'

A large addition of cross-bred apple seedlings and grafted specimens of the named varieties of cross-breds was made to the *Pyrus* orchards during the past season. Nearly every specimen became established and we have now growing on the farm a large representative collection of this class of apples, which should prove most interesting on coming into bearing.

The following is a descriptive list of the more meritorious varieties of apples fruited this season. All of these make excellent preserves when cooked whole.

Martha Seedling, No. 1.—Colour, deep yellow slightly streaked with red; diameter, $1\frac{1}{8}$ inches; flattish; seed cavity medium; ripe middle August; flesh firm, sweet and juicy; calyx persistent.

Martha Seedling, No. 2.—Colour, deep yellow slightly streaked with red; diameter, $1\frac{3}{8}$ inches; seed cavity very small; flesh firm, sweet and juicy, with a pleasant aroma; shape, flattish oval; ripe late September; calyx persistent.

Martha Seedling, No. 3.—Colour, bright red; diameter, $1\frac{1}{4}$ inches; seed cavity medium; flesh somewhat soft, rather dry but sweet; ripe, early August; calyx persistent.

Martha Seedling, No. 4.—Colour, deep yellow; diameter, $1\frac{3}{16}$ inches; seed cavity rather large; flesh soft and mealy; sweet; ripe early in September; calyx persistent.

Martha Seedling, No. 5.—Colour, bright yellow, dotted and streaked with red; diameter, $1\frac{2}{16}$ inches; seed cavity, small; flesh firm, sweet and juicy, slightly astringent; shape, flattish; ripe early September; calyx persistent.

Martha Seedling, No. 6.—Colour, deep yellow, streaked heavily with red on sunny side; diameter $1\frac{1}{16}$ inches; seed cavity small; flesh firm, sweet and juicy; shape flattish oval; ripe late in August; calyx persistent. The best of the Martha seedlings yet fruited.

Martha Seedling, No. 7.—Colour, deep yellow, slightly streaked with red; diameter, $1\frac{3}{16}$ inches; seed cavity large; flesh firm, sweet and juicy, with a pleasant aroma; shape, flattish; ripe late in August; calyx persistent. One of the best flavoured varieties.

Snyder Seedling, No. 8.—Colour, deep yellow, slightly streaked with red on sunny side; diameter, $1\frac{3}{16}$ inches; flesh firm, sweet and juicy; seed cavity small; shape roundish; ripe early September; calyx persistent.

Pyrus baccata x *Wealthy, No. 9.*—Colour, deep red on sunny side, reverse side light yellow slightly streaked with red; diameter, $1\frac{1}{4}$ inches; seed cavity, medium; ripe second week in September; flesh firm and juicy, slightly astringent; calyx persistent; skin very thin and susceptible to bruising.

Cross-bred Pyrus Seedling, No. 10.—Colour very bright red; diameter $1\frac{3}{16}$ inches; shape roundish; seed cavity medium; flesh crisp and juicy and slightly astringent; ripe late August; calyx persistent.

No. 116, Pyrus baccata x Tetofsky, No. 11.—Colour bright red; diameter, $1\frac{3}{16}$ inches; seed cavity small; flesh, soft and mealy, sweet; shape flattish; ripe, middle of September; calyx persistent.

Pyrus baccata x *Talman's Sweet, No. 12.*—Colour deep yellow, very slightly streaked with red on sunny side; diameter, $1\frac{5}{16}$ inches; seed cavity, medium; flesh, firm and juicy, sub-acid, slightly astringent; shape, flattish round, ripe early in October; calyx persistent.

Pyrus baccata x *Talman's Sweet, No. 13.*—Colour, deep red; diameter, $1\frac{5}{16}$ inches; seed cavity small to medium; flesh, firm, sweet and juicy, very slightly astringent; ripe late in August, calyx persistent. A good variety.

Pyrus baccata x *Talman's Sweet, No. 14.*—Colour, deep yellow. fairly streaked with red on sunny side; diameter, $1\frac{5}{16}$ inches; seed cavity, medium; flesh firm, sweet, no astringency; ripe early October; calyx persistent. A good sort.

Pyrus baccata, No. 529, No. 15.—Colour, bright yellow, streaked with red on sunny side; diameter, $1\frac{3}{16}$ inches; flesh firm, juicy and sweet; seed cavity, medium; ripe, early August; calyx persistent.

No 125, Parker.—Colour, deep yellow, heavily splashed with red on sunny side; diameter, $1\frac{7}{16}$ inches; flesh firm, juicy and slightly astringent; seed cavity, medium; ripe middle of September; calyx persistent.

Transcendent crab.—The large tree of this variety growing on the hillside again produced a fair crop of excellent fruit. On account of having been used as a source of supply for scions, the crop was not as heavy as it it would otherwise have been.

PLUMS.

The plum crop of 1903 was the heaviest ever recorded on the Experimental Farm. The fruit set in such profusion that the branches were weighted to the ground, many of them breaking when the fruit attained full size. The trees of the native plum (*Prunus nigra*), ripened practically all their fruit, but those of the American plum (*Prunus Americana*), failed to ripen, authough some large fruit was produced on some specimens of this class.

SMALL FRUITS.

RASPBERRIES.

The raspberry crop was only a fair one during the past season, though the crop throughout the province was much above the average. An interesting test was made in order to determine the efficacy of laying down the canes in the fall of the year in order to prevent winter-killing. One-half the row of each variety was laid down, the tips of the canes being held down by a light furrow thrown on them with the plough, the balance being left standing. On the approach of spring the canes were lifted, and while the covered canes were found to be in good condition, those unprotected were dead to snowline. It is evident that, in exposed positions it would be wise to lay down the canes and partly cover them, as described.

CURRANTS.

The currant crop was an excellent one throughout the province the past season, although, on account of change of location of the currant plantation at the Experimental Farm, the crop was below the average.

TREES, SHRUBS, HEDGES, &c.

HEDGES.

No additions were made to the list of trial hedges during the past season, but we would call attention to one or two which have been planted quite recently.

Cedar or Arbor-Vitæ (Thuya occidentalis), planted 1900.—Though somewhat slow growing, this is proving quite hardy, and gives promise of making a most symmetrical hedge in the near future, and it bears clipping well.

Rhamnus cathartica (Buckthorn).—This plant is receiving considerable attention from the farmers as a hedge plant and seems to promise well for that purpose. The branches are more or less spined, and it should make a good hedge. It is hardy here.

One of the best thorn hedges growing on the farm is that composed of the native Buffalo Berry *(Shepherdia argentea)*. Though not a rapid grower, the numerous spines with which it is covered render it a very impervious hedge even when quite small, and its beautiful silvery foliage makes it a striking object during the summer season.

The large hedge of Native Spruce *(Picea alba)*, planted in 1893, and now 14 feet high continues to prove very satisfactory and does not show the slightest signs of deterioration on account of crowding, being green from top to base.

The large double-rowed maple hedges *(Acer Negundo)*, surrounding the shelter blocks at the south end of the farm, were given a good pruning this season, which greatly added to their appearance.

Several of these sample hedges, which were in a low portion of ground near the superintendent's house, were injured by the heavy floods of a year ago, and it seems doubtful if they will ever thoroughly recover.

ARBORETUM.

No additions were made to the Arboretum during 1903. The following is a list of varieties planted in 1902, together with notes on their condition this year.

Crataegus oxyacantha (English Hawthorn).—Killed to snow-line; strong growth; 1903.

Ostrya virginica (Ironwood).—Wintered well; very small growth; 1903.

Banksian Pine *(Pinus banksiana)*.—Wintered well; fair growth; 1903.

Red Pine *(Pinus resinosa)*.—Wintered well; fair growth; 1903.

CANKER ON RUSSIAN POPLAR.

This disease continues to make rapid progress on the Experimental Farm, many of the trees of Russian Poplar being more or less seriously affected by it. The canker (a fungus growth), rots the wood tissue, causing the limbs and trunk to break off at the diseased point during high winds. There seems to be no question, but that cuttings made from the affected trees soon exhibit symptoms of the disease, consequently it may be advisable to make a new commencement from seed. This tree is a very rapid grower.

CRATAEGUS—NIEMETZ (HAWTHORN).

Several of these thorns, procured by Dr. Saunders from Russia from Mr. Niemetz, are growing in the arboretum here, and are well worthy of special notice on account of their comparatively rapid growth, handsome appearance and great hardiness.

Many inquiries are received as to suitable material for thorn hedges, and it seems probable that these would be suitable for this purpose. They are similar in growth to our native thorn *(Crataegus coccinea)* and produce similar offensive spikes, which would render a hedge of this sort almost impenetrable.

FLOWERING SHRUBS.

Owing to the absence of spring frosts the numerous varieties of flowering shrubs on the farm were much above the average this season, and brought forth enthusiastic comment from visitors, the lilacs, spireas and honeysuckles being especially fine.

LILAC—CHARLES X.

This is a magnificent form of the common lilac, with very large heads of flowers, which are produced much more abundantly than with the common variety. It has also

the advantage of flowering when comparatively young. It may be propagated by grafting on the common stock.

SEEDLINGS OF LILAC CHARLES X.

The hedge composed of seedlings of Charles X. lilac surrounding one of the Pyrus orchards, flowered heavily for the first time last season, and was very interesting from the fact that they are the first seedlings of this variety yet flowered on the farm. A large percentage of the plants produced flowers quite equal to the parent variety, but the most noticeable peculiarity was the great range of colour, a large number of shades being represented. It is evident that this is a very satisfactory method of propagation.

EUONYMUS LINEARIS.

This dwarf growing shrub flowered for the first time this year. The flowers are very striking both in colour and form, and the plant blooms when quite young.

JAPAN LILAC (SYRINGA VILLOSA).

A very distinct form, flowering later than the other varieties, and of a different form and colour. The flower spikes are large, and of a reddish white colour. Its late flowering greatly lengthens the period of lilac blooms.

PHILADELPHUS GRANDIFLORUS (MOCK ORANGE).

A test was made during the fall of 1902, in order to ascertain the possibility of flowering this beautiful shrub, by means of covering; though the roots are perfectly hardy, the branches are usually killed to snow line, hence the total absence of flowers the following season. The test was partially successful, and a number of flowers were produced during the past summer. A more thorough covering was given before the present winter set in, and we hope thus to still further increase the value of this beautiful flowering shrub.

SPIRAEAS.

We would call special attention to a few varieties of this hardy flowering class, which is one of the most satisfactory for the North-west.

Spiraea hypericifolia.
Spiraea Van Houttei.
Spirae sorbifolia.

These are arranged in order of earliness, the flowers being produced during a considerable period.

FALL SOWING OF SEEDS COMPARED WITH STRATIFICATION.

A test was undertaken to find out whether the fall sowing of seeds of flowering shrubs and fruits would be as advantageous, as the means usually adopted, viz., stratification. The latter method is accomplished by filling a box in the fall with alternate layers of the seed and sand, and leaving it in the open where it will be exposed to the full rigour of winter. The boxes are opened, and the seed sown as early as possible in the spring. It is expected that the action of the winter's frost will conduce to quick germination. It will be readily seen that fall sowing would lessen the amount of labour. There is also a drawback to be considered when stratification is resorted to, and that is, that germination sometimes begins in the boxes before spring sowing is possible, and when the box is opened a mass of intergrown, attenuated seedlings are sometimes brought to light. Included in this test were the following varieties:—*Acer ginnala, Acer tatarica, Lonicera tatarica* and *Pyrus baccata.*

The seed germinated readily in the spring, and the seedlings successfully stood a fairly severe frost. From the results of this experiment it would appear that fall sowing may be resorted to with good prospect of success.

DISTRIBUTION.

A large number of seedlings of flowering shrubs and hedge plants are grown on the farm every year for distribution the following spring. The demand, however, is so great that it is not often that all the applicants can be supplied.

THE VEGETABLE GARDEN.

GARDEN PEASE.

Thirty-nine varieties of garden pease were sown in the open ground on May 3, the seed having been grown on the Brandon Experimental Farm in 1902. It was very satisfactory to note that the percentage of germination was in every case excellent, corroborating former experience that Manitoba-grown pease are much above the average.

All varieties again ripened their own seed, and the results of the test follows, arranged in order of earliness.

GARDEN PEASE.

Varieties.	Length of Pod.	Length of Vine.	Peas in Pod.	Flavour.	Productiveness.
	In.	In.			
Steele Briggs' Extra Early	2 to 2¼	16	4 to 5	Fairly sweet	Very productive.
Tom Thumb	2¼ " 2½	24	6 " 7	"	Fairly "
Philadelphia Extra Early	2¼ " 2½	36	6 " 7	"	" "
Bruce's Early Conqueror	2 " 2¼	24	4 " 5	"	Not "
Alaska	2¼ " 2½	26	6 " 7	"	Fairly "
Rural New Yorker	2¾ " 3	28	5 " 6	"	" "
Extra Early Daniel O'Rourke	2 " 2½	30	5 " 6	"	Very "
Carter's First Crop	2½ " 3	26	5 " 6	"	Fairly "
McLean's Little Gem	2 " 2¼	18	5 " 6	"	" "
McLean's Blue Peter	2½ " 3	14	5 " 6	Sweet	" "
Gregory's Surprise	2½ " 3	36	6 " 7	Fairly sweet	" "
Extra Early Exonian	2 " 2¼	18	4 " 5	Sweet	Very "
Admiral	2½ " 3	36	6 " 7	"	" "
American Wonder	2½ " 3	14	6 " 7	Very sweet	" "
Surprise	2 " 2¼	26	4 " 5	Sweet	Not "
Nott's Excelsior	2½ " 3	14	6 " 7	"	Very "
Prosperity or Gradus	3 " 3½	30	5 " 6	Very sweet	Not "
William Hurst	3 " 3½	18	7 " 8	"	Very "
Horsford's Market Garden	2¾ " 3	30	6 " 7	"	" "
Blue Imperial	2½ " 3	24	5 " 6	Fairly sweet	Fairly "
Laxton's Supreme	3¼ " 3½	36	8 " 9	Sweet	" "
Blue Beauty	2½ " 3	18	5 " 6	Fairly sweet	" "
Rennie's Queen	3 " 3¼	30	8 " 9	Very sweet	" "
Pride of Market	2½ " 3	30	7 " 8	Fairly sweet	" "
Rennie's Perfection	3 " 3¼	30	6 " 7	Very sweet	" "
Juno	3 " 3½	30	8 " 9	Excellent	Very "
Thomas Laxton	3¼ " 3½	30	6 " 7	Very sweet	Fairly "
Fillbasket	2½ " 3	36	6 " 7	"	Very "
C. P. R.	3 " 3¼	18	5 " 6	"	" "
Telephone	3½ " 3¾	36	7 " 8	"	" "
Stratagem	3¼ " 3½	24	7 " 9	"	" "
Duke of York	3¼ " 3½	36	8 " 9	"	" "
Duke of Albany	3 " 3¼	36	7 " 8	"	Fairly "
Champion of England	3¼ " 3½	40	8 " 9	Fairly sweet	Very "
Allen's Dwarf Telephone	3¼ " 3½	20	8 " 9	Very sweet	Fairly "
Yorkshire Hero	3¼ " 3½	28	8 " 9	"	" "
Shropshire Hero	3½ " 3¾	30	8 " 9	"	" "
Early Dwarf Brittany	Edible podded varieties.			"	Very "
Tall Scimitar	"	"		"	" "

ONIONS.

Seven varieties of onions were sown on April 14 in rows 12 inches apart, with Planet Junior hand drill. The germination was excellent in all cases, and the product above the average both in yield and quality. The yield of the Red Prize Taker, a variety tested here for the first time this season, has been large, and this may be a valuable onion for this province. Following will be found the result of this test, arranged in order of productiveness:—

ONIONS.

Varieties.	Sown.	Pulled.	Colour.	Shape.	Yield per Acre.	
					Bush.	Lbs.
Prize Taker (Red)	May 14	Sept. 8	Deep red	Globular	871	12
Red Wethersfield	" 14	" 8	"	Flattish	671	13
Trebon's Yellow	" 14	" 8	Light yellow	Globular	544	30
Yellow Globe, Danvers	" 14	" 8	Dark "	"	508	17
Gibraltar	" 14	" 8	Light "	"	471	54
Paris's Silverskin Market	" 14	" 8	White	Flattish	435	36
Favourite Keeping	" 14	" 8	Light yellow	Globular	381	9

SQUASH AND PUMPKINS.

Forty-six varieties of squash and pumpkins were sown in the open on May 28, in hills ten feet apart each way. The coolness of the summer prevented the best results being obtained, although a very fair yield was had, many of the varieties coming quite up to the average.

We would again point out the special value of the Bush forms of squash as compared with the running varieties, on account of their earliness and ease of cultivation. Extra Early Orange Marrow continues to merit our good opinion, as to its being the best substitute for a pie pumpkin yet tested here.

The following results were obtained:—

SQUASH AND PUMPKINS.

Varieties.	Sown.	Ripe and Ready.	Colour of Skin.	Colour of Flesh.	Form.	Weight.	Quality.
						Lbs	
Grey Mammoth	May 28	Sept. 20	Green'h white	Light yellow	R	30	Rough for feed.
Jumbo	" 28	" 20	Bright yellow	"	R	25	"
Golden Oblong	" 28				R	....	Did not mature fruit.
Japanese Pie	" 28	Sept. 15	Dark yellow	Light yellow	R	10	Fine for pies.
Cushaw	" 28				R	....	Did not produce fruit
Sweet or Sugar	" 28	Sept. 15	Dark yellow	Light yellow	R	8	Fine for pies.
Mammoth Tours	" 28	" 20	Green'h white	Green'h yellow	R	20	Rough for feed.
Jonathan	" 28	" 20	Bright yellow	Light yellow	R	25	"
Red Etampes	" 28				R	....	Did not mature fruit.
Large Field	" 28	Sept. 10	Deep yellow	Light yellow	R	32	Rough for feed.
Nantucket or Negro	" 28	" 15	Deep green	"	R	15	"
Winter Luxury	" 28	" 20	Light yellow	"	R	10	Fine for pies.
Mammoth King	" 28	" 20	Deep yellow	Med. yellow	R	35	Rough for feed.
Japan Crookneck	" 28				R	....	Did not produce fruit
Mammoth Globe	" 28	Sept. 20	Deep green	Light yellow	R	33	Rough for feed.
Golden Bronze	" 28				R	....	Did not mature fruit.
Turban	" 28	Sept. 20	Orange	Light yellow	R	6	Fair quality.
Chicago Warted Hubbard	" 28				R	....	Did not mature fruit.
Perfect Gem	" 28				R	....	" "

SQUASH AND PUMPKINS—*Concluded.*

Varieties.	Sown.	Ripe and Ready.	Colour of Skin.	Colour of Flesh.	Form.	Weight.	Quality.
						Lbs	
Pike's Peak or Silby	" 28	Sept. 25	Green'h white.	Green'h yellow	R	10	Good quality.
Mammoth Whale	" 28	" 15	Deep green	Light yellow	R	38	Rough for feed.
Winter Crookneck	" 28				R	....	Fruit did not ripen.
Summer Crookneck	" 28	Aug. 20	Orange	Deep yellow	R	7	Valueless.
Canada Crookneck	" 28	" 20	"	"	R	7	"
Boston	" 28				R	...	Did not produce fruit
Cocoanut	" 28				R	....	" "
Golden Hubbard	" 28	Sept. 10	Deep yellow.	Light yellow	B	11	Good.
Italian Marrow	" 28	" 10	Light yellow.	Cream yellow.	B	9	Excellent.
Faxon	" 28				R	....	Did not produce fruit
Long White Bush Marrow	" 28	Aug. 12	Yellow'h white	Yellow'h white	B	12	Excellent.
Der Wing	" 28				R	...	Did not produce fruit
Long Isd. Bush Scalloped.	" 28	Sept. 1	White	Yellow'h white	B	3	Fair.
Fordhook	" 28				R	....	Did not mature fruit.
Early Golden	" 28	Aug. 25	Deep yellow	Light yellow	B	5	Valueless.
Warren	" 28				R	....	Did not mature fruit.
English Vegetable Marrow	" 28	Aug. 25	Yellow'h white	Yellow'h white	R	7	Excellent.
Cocozelle Bush	" 28	" 15	Green'h white.	" "	B	12	"
Silver Custard	" 28	Sept. 5	White	Whitish	B	4	Fair.
White Bush Scalloped	" 28	" 5	"	"	B	4	"
Marble Head	" 28				R	....	Did not produce fruit
Delicata	" 28				R	....	" "
Ex. Early Orange Marrow	" 28	Sept. 1	Deep orange	Light yellow	R	10	Fine for pies.
Golden Custard Bush	" 28	Aug. 25	" yellow	"	B	5	Valueless.
Pine Apple	" 28				R	....	Did not mature fruit.
Delicious	" 28				R	....	" "
Bay State	" 28				R	....	" "

BEANS.

Seven varieties of beans were sown in the open on May 29, in rows 30 inches apart; and with one exception a most satisfactory crop was obtained. The exception was the variety, Henderson's Dwarf Bush Lima, the earliest bean of this type which is listed by American seedsmen, but it failed to arrive at a fit condition for table. The results of this test are given below, the varieties being arranged in order of earliness.

Varieties.	Sown.	Colour Pod.	Length of Pod.	Texture and Flavour.	Ripened.
Dwarf Golden Skinless	May 29	Light yellow	5 inches	Fairly tender good	None.
Dwarf French matchless	" 29	"	5 "	Very tender good	"
Bagnolet	" 29	Green	6 "	" "	"
Dwarf Inexhaustible	" 29	"	6 "	Tender good	"
Fame of Vitry	" 29	"	6½ "	Fairly tender good	"
Emperor of Russia	" 29	"	6½ "	Tender	"
Henderson's Bush Lima	" 29	Did not reach condition for table.			

CABBAGE.

Eight varieties of cabbage were sown in cold frames on April 20, and transplanted to the open on May 23. All varieties did well, but special attention is called to the Savoy cabbage (Green Globe). This is a late variety which has proven to be excellent for winter storage, far better than the others in this respect.

The following results were obtained:—

Variety.	Sown.	Transplanted.	Early or Late.	Texture.	Average weight.
					Lbs.
Paris Market, very early	April 20	May 23	Very early	Fairly firm	8
Early Express	" 20	" 23	Early	Somewhat loose	7
Early Jersey Wakefield	" 20	" 23	"	Firm	8
Early Winningstadt	" 20	" 23	Summer	Very firm	9
Midsummer Savoy	" 20	" 23	"	Loose	5–6
Fottler's Drumhead	" 20	" 23	Late	Very firm	13
Green Globe Savoy	" 20	" 23	"	Fairly firm	8
Red Drumhead	" 20	" 23	"	Very firm	9

PARSNIPS.

Three varieties of parsnips were sown on April 14, in rows 30 inches apart, with a Planet Junior hand drill. Hollow Crown gave the heaviest yield, and ranked first in regard to quality. The Student is a turnip-shaped variety of fair quality, and very easy to harvest, this with the long varieties being a somewhat difficult operation.

The following results were had :

Varieties.	Sown.	Lifted.	Shape.	Flavour.	Yield per Acre.	
					Bush.	Lbs.
Hollow Crown	April 14	October 5	Long	Good	667	55
Half Long	" 14	" 5	Half-long	Fair	435	36
Student	" 14	" 5	Short	"	412	9

TOMATOES.

Two varieties of tomatoes were sown in the hotbed on April 20, and transplanted to the open on May 27. The most noticeable point in connection with this test was the early planting out (May 27).

The plants escaped frost, and a larger quantity of ripe fruit was harvested than usual.

Varieties.	Sown.	Transplanted.	Ripe.	Colour.	Shape.	Flavour.
Century	April 20	May 27	August 25	Bright red	Smooth	Meaty, very juicy.
Earliana	" 20	" 27	" 10	"	Ribbed	Fair.

Representatives of all standard varieties of vegetables not referred to in the foregoing, were tested during the past season, including radish, citron, &c., with uniformly good results. The twenty varieties of rhubarb under trial gave heavy returns. A quantity of rhubarb seed of the best varieties was gathered for distribution.

LIST OF VARIETIES OF VEGETABLES ESPECIALLY SUITABLE FOR MANITOBA.

Many inquiries are made of the officers of the Experimental Farm regarding the most profitable varieties of vegetables to grow in this province. Following will be

found a list of selected varieties compiled from the results of several years' trial on this farm:—

Asparagus.—Conover's Colossal, Columbia, Mammoth White.

Beans (Dwarf).—Canadian Wonder (yellow podded), Scarlet Flageolet Wax (yellow podded), Stringless Green Podded (green podded).

Beans, Broad.—Broad Windsor.

Beets.—Early Blood Turnip (early), Long Smooth Deep Blood Red (for winter storage).

Cabbage.—Paris Market Very Early (early), Early Jersey Wakefield (early), the Lupton (late), Marblehead Mammoth (late), Large Red Drumhead (late), Drumhead Vertus (Savoy).

Carrots.—Early Scarlet Horn (early), Half-long Danvers (late).

Celery.—White Plume (early), Giant Pascal (early), London Red (early).

Cauliflower.—Early Snowball (early and medium), Extra Early Paris (early and medium).

Cress or Pepper-grass.—Extra curled.

Cucumbers.—Early Cluster, Cumberland, White Wonder

Corn, Sweet.—Early Cory.

Corn, Flint.—Mitchell's Extra Early.

Lettuce.—Neapolitan (cabbage), White Paris Cos (cos).

Kohl Rabi.—Early White Vienna.

Musk Melon.—Extra Early Green.

Citron.—Colorado Mammoth.

Parsnip.—Hollow Crown (long), Student (short).

Onion Sets.—Yellow Dutch, English Multipliers, Shallots.

Onion (Seed).—Yellow Globe Danvers (large), Red Prize Taker (large), Gibraltar (large), Adriatic White Barletta (pickling).

Peas.—Extra Early Exonian (1st early), William Hurst (2nd early), American Wonder (2nd early), Juno (late), Shropshire Hero (late).

Parsley.—Moss Curled.

Radish.—Early Scarlet Turnip, French Breakfast.

Spinach.—Victoria.

Squash.—Extra Early Orange Marrow, English Vegetable Marrow, Long White Bush Marrow.

Salsify.—Sandwich Island.

Tomatoes.—Earliana, Earliest of All, Early Ruby.

Turnip (Garden).—Early Snowball, Robertson's Golden Ball.

Herbs.—Sage, Savory, Thyme, Parsley.

SAVORY AND MEDICINAL HERBS.

Twenty-three varieties of herbs were sown in the open on May 28. Owing to the somewhat cool summer and late date of sowing, few of them arrived at maturity, and several failed to germinate. Among those which succeeded best were, Tansy, Lemon Thyme, Coriander, Rosemary, Borage, Rue, Sweet Basil, Winter Savory, Dill and Anise Seed.

PEANUTS.

A small quantity of peanuts, catalogued as a very early variety, was purchased from a Canadian seedsman and sown in the open on May 28.

They germinated promptly, but although they made excellent growth, they failed to produce the slightest signs of tubers.

FLOWERS.

The usual representative collection of annuals was again sown on the Farm during the past season, with excellent results. Owing to the very bright weather experienced during the early spring, large healthy plants were available at planting out time, and as there were no late frosts the annuals came quickly into flower, presenting a mass of colour throughout the season. Petunias (single and double), Phlox, Verbenas and Stocks were especially fine, and called forth much favourable comment. In consequence of the disastrous results to the garden experienced last season by reason of the accumulation of water in the valley, the beds were raised from 12 to 18 inches, which proved to be very satisfactory, and it is hoped that the results will be permanent.

HARDY ROSES.

Two varieties of hardy roses at present growing on the farm continue to prove hardy, and gave an exceptionally heavy crop of flowers during the summer. It is unfortunate that both these varieties were received from individuals who had lost their names, as they are likely to be of special value to Manitoba and the North-west, on account of their hardiness. The colour of one is a light pink, that of the other a deep red, and both are double. Propagation is readily effected by means of suckers which are produced abundantly by both these varieties.

LILIES.

The following varieties of lilies planted in 1902 have proved thoroughly hardy without the slightest protection:—

Lilium Dahuricum Gretchen.
" " atrosanguineum.
" " incomparabile.
" " Brittanicum.
" " grandiflorum.
" Hansoni.
" tigrinum, fl; pl.
" Tottenhami.
" Sensation.
" elegans Van Houttei.
" " aureum.

These are very free flowering varieties, with large individual flowers of bright colouring. They come into bloom early in the season and remain in flower for a considerable period.

TULIPS AND OTHER SPRING FLOWERING BULBS.

Tulips made an exceptionally fine display during the past season, and the large collection of named varieties was much appreciated by all lovers of flowers. This is no doubt the most satisfactory spring flowering bulb for the North-west, and by a judicious selection of varieties, the blooming period can be prolonged for a considerable time. Tulips are quite hardy here without protection.

SNOWDROPS.

Bulbs of this beautiful harbinger of spring, planted on the farm in the fall of 1902, have now successfully passed through two winters. It is gratifying to know that this old-fashioned flower can be satisfactorily grown in Manitoba.

SCILLA SIBIRICA ALBA.

This is similar to the well known blue Squill, with the exception of colour, which is a pure white, and as an edging for a bed, alternated with the blue variety, it is very useful, and is perfectly hardy without protection.

COLCHIUM AUTUMNALE (FALL CROCUS).

This bulbous flower deserves special mention on account of its being the last plant of the season to come into bloom. After the ground is covered with snow the flower will push itself through, resembling (at a casual glance) our spring Anemone, and being thoroughly hardy, is a welcome addition to our list of bulbous perennials.

PUSCHKINIA SCILLOIDES.

Special attention is called to this beautiful spring flowering bulb, which has now come through two winters at the Experimental Farm in good condition without protection. As its name implies, it is squill-like in appearance, but differs in having a distinct white band down the centre of each petal, rendering it very attractive.

CROCUS.

These bulbs, planted in the fall of 1902, have now passed successfully through two winters, and it appears that they may be considered as hardy in the North-west. They make a decided acquisition to our list of spring flowering bulbs.

FRITILLARIAS.

Of a large number of these bulbs planted in 1901, two came through the winter of 1901-02, but did not flower. The same bulbs also wintered successfully in 1902-03, but again failed to produce flowers.

HERBACEOUS PERENNIALS.

None of the varieties under test succumbed during the past winter, and a very creditable show of flowers was made during the summer, the large number of varieties of Iris and Peonies being especially fine. This branch of floriculture is becoming more popular with farmers each year.

PROPAGATION OF TREES FOR THE FORESTRY BRANCH OF THE DEPARTMENT OF THE INTERIOR.

All the 876,000 trees grown here in 1902 for the above department were distributed this spring to farmers in different parts of the province, and the percentage of loss, I understand, was very small.

About one million and a half trees were grown here this year for future distribution by the Forestry Branch, nearly all the young trees were dug in the fall and healed in ready for spring shipping.

DISTRIBUTION OF GRAIN, POTATOES, &c.

The usual distribution was made of grain, potatoes, maple seed, rhubarb seed and flower seeds. The following quantities were sent out to applicants:—

Grain of all kinds in 3-pound bags	161
Seedling trees and shrubs, packages	555
Potatoes in 3-pound bags	241
Maple seed in ½-pound bags	137
Rhubarb seed, packages	64
Flower seeds, packages	117

The following reports have been received from parties to whom Manitoba maple seeds were sent in 1-pound packages during the spring of 1902:—

Number of applicants supplied	216
Number of reports received	74

	Successes.	Failures.
Seeds sown on summer-fallow	21	4
" " spring ploughing	9	4
" " backsetting	10	5
" " garden (dug with spade)	10	2

Maximum number of trees grown from one packet	2,500

INJURIOUS INSECTS.

Red Spider *(Tetranychus telarius)* was very numerous and destructive on the native White Spruce during the early summer; many of the lower branches were discoloured, and in some instances the needles were stripped from them.

Green Lice *(Aphis)* were also plentiful on the native Ash-leaved Maple for a short time, but these disappeared during the heavy rains of August.

The Western Blister-Beetle *(Cantharis Nutalli)* was very numerous on English Horse Beans, and a few were also found on potatoes. In a very few days they stripped the leaves from the plants, but quickly succumbed to a spraying of Paris Green and water; a teaspoonful of the poison to a pail of water.

NEW BRIDGE.

During the year a new traffic bridge has been built across Lake Percy, replacing the unsafe pontoon foot bridge in use for many years, and making the southern portion of the farm easy of access.

SAMPLES FOR EXHIBITION PURPOSES.

Twenty large cases of exhibits have been prepared and forwarded to Ottawa for the exhibition to be held at St. Louis next year. These contain grain in the straw, grasses and preserved fruits and vegetables; a portion of this exhibit was grown on the Experimental Farm and the balance collected from farmers throughout the province. In every instance the name of the grower is attached to the exhibit. In addition to the above, a large collection of threshed grain has been prepared for the same purpose.

The usual exhibits were made at the Brandon Agricultural and Horticultural Shows, and a display was also made at the Western Horticultural Exhibition at Winnipeg.

The Department of the Interior was supplied with a quantity of millets and grain for the use of their immigration offices in both Europe and the United States.

FARMERS' MEETINGS.

During the year meetings were attended and addresses given at the following places:—

Winnipeg, December 30, 1902.
Oak Lake, January 2, 1903.
Winnipeg, February 19, 1903.
Winnipeg, February 26, 1903.
Deloraine, March 17, 1903.
Boissevain, March 19, 1903.
Killarney, March 19, 1903.
Cartwright, March 20, 1903.
Crystal City, March 20, 1903.
Manitou, March 21, 1903.

VISITORS.

The number of visitors to the Experimental Farm during the past year has exceeded all previous records, approximating 12,000. In addition to the large number of delegates from the United States, the farm was honoured with a visit from the 200 British delegates attending the fifth Congress of the Chambers of Commerce, held at Montreal. They spent some time on the farm, and appeared much interested in the experiments in progress.

Representatives of some of the largest British flour mills were particularly interested in the production of No. 1 wheat, which they spoke very highly of. A field of Banner oats just harvested attracted the attention of the oatmeal millers in the party.

The usual provincial ploughing match and picnic was held on the farm, and the attendance was above the average.

METEOROLOGICAL TABLES.

Months.	Highest temperature.		Lowest temperature.		Total rainfall.	Total snowfall.	Total amount of sunshine.
1902.	Day.	Deg.	Day.	Deg.	Inches.	Inches.	Hours.
December	31	32	25	—40	....	13	84·3
1903.							
January	25	38	30	—35	....	19	87·8
February	15	30	16	—44	....	6	157·8
March	31	47	20	—21	....	1	151·9
April	18	80	29	10	·41	2	190·1
May	14	88	2	18	4·29	....	195·4
June	26	87	22	35	·67	....	237·9
July	23	94	13	39	2·13	....	258·4
August	20	89	29	38	3·93	....	178·5
September	28	73	14	22	1·97	12	140·3
October	24	70	17	14	·89	....	181·8
November	2	67	24	—18	....	....	112·8
					14·29	53	1977·0

CORRESPONDENCE.

This year 3,767 letters were received and 2,848 despatched, irrespective of circulars sent out.

I have the honour to be, sir,
Your obedient servant,

S. A. BEDFORD,
Superintendent.

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF ANGUS MACKAY. SUPERINTENDENT.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.,
November 30, 1903.

DR. WM. SAUNDERS,
Director, Experimental Farms,
Ottawa.

SIR,—I have the honour to submit to you the sixteenth annual report of the operations of the Experimental Farm for the North-west Territories at Indian Head, Assiniboia, during the year 1903.

Like all its predecessors, the past season has had its drawbacks, and though the crops throughout the Territories have not realized what they promised at one time, many districts have given good returns, though a good deal of the grain is inferior.

With the exception of one or two seasons, the soil was never so dry as in the fall of last year, in the wheat-growing districts of Assiniboia, and this spring being without rain till May 17, the grain, though sown early, was in many cases very late in germinating, and August being cold and wet, all the late germinating crops were slow in maturing, and were caught by frost on morning of September 5, and injured according to the stage of ripeness they were in. In most cases the injured grain was on fallowed land, especially where fallows were ploughed deep, just before or after harvest last fall, causing the soil to dry out,, leaving it loose and subject to the dry winds of winter and early spring. Crops on breaking and backsetting were in some cases injured also from the same cause as operated against the crops on fallowed land. Grain on stubble land invariably ripened before frost visited the country, and as a rule gave satisfactory returns.

Harvest started from August 20 to 25, but was often delayed by heavy rain storms, which were more or less prevalent during all of September. October was fine, and permitted threshing to be carried on with few interruptions, and in many districts it was completed in that month.

Stock throughout the territories did well the past season, though at present prices do not rule as high as last year.

EXPERIMENTAL FARM CROPS.

The crops on the Experimental Farm were, with a few exceptions, extra good. In grain the yields were large, especially in oats and barley. The wheat yields also were satisfactory, but the late varieties were injured by the frost and rust.

Corn, potatoes and roots, with carrots excepted, gave large returns.

The hay crop, on account of the dry spring, was not heavy.

In cultivated fruits, raspberries and crab apples gave good crops. Currants, gooseberries and plums were failures. Native fruits were completely destroyed by May frosts.

I wish to draw the attention of territorial wheat growers to the varieties of wheat, Preston, Stanley and Huron, which have been tested for some years on the Experimental Farm. These varieties were sown later than Red Fife, and were ripe, cut and in stook five or six days before frost came, while Red Fife was injured by the cold wave

that passed over on the morning of September 5. The two varieties, Preston and Stanley, are cross bred wheats, originated by Dr. Saunders, Director of Experimental Farms, Preston being bearded and Stanley bald. The parents of both varieties were Red Fife and Ladoga. The leading milling authorities in Great Britain and the United States, after thorough tests, pronounce both wheats about equal to Red Fife in milling qualities.

Huron, a bearded sort, is also a cross-bred, originated by Dr. A. P. Saunders, Ladoga and White Fife being the parents. It has always been near the top in yield, and this year heads the list in productiveness. It also matured before the frost came. Preston, Stanley and Huron were the only sorts, out of nine varieties sown, that will grade N. 1 Hard, Monarch and Percy, though fairly ripe, had heads not matured, which the frost injured.

EXPERIMENTS WITH WHEAT.

Sixty-two varieties of wheat were tested on 1-20 or 1-40 acre plots. These were sown by hoe drill on April 18 on fallowed land, 1½ bushels seed was sown per acre, the soil being a clay loam. As will be seen, many of the sorts were too late in maturing. In comparing Preston, Stanley and Huron in this list, and in the field lots, it will be seen that they correspond fairly well in yield and ripening. A number of the varieties were struck by rust, causing sample to be very poor.

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
					In.		In.		Lbs.	Bush.	Lbs.		
1	Mahmoudi	Sept.	8	143	45	Strong..	3½	Bearded	4,080	46	..	60½	
2	Weldon	"	8	143	50	"	4½	Bald ...	3,260	43	40	60	Slightly.
3	Preston	"	1	136	50	"	3½	Bearded	4,250	43	10	60½	"
4	Kahla	"	8	143	46	"	2	"	2,880	42	40	61	
5	Hungarian	"	2	137	50	"	3	"	3,240	42	..	59	Considerably.
6	Pringle's Champlain	"	4	139	49	"	4	"	4,100	41	40	63	Very slightly.
7	Roumanian	"	8	143	50	"	3	"	3,940	41	..	61½	
8	Fraser	Aug.	26	130	47	"	3¼	"	5,005	39	35	62½	Slightly.
9	Stanley	Sept.	1	136	50	"	4	Bald ...	4,370	39	10	59	Very slightly.
10	Huron	"	1	136	50	"	3¼	Bearded	4,700	39	..	60	Slightly.
11	Adjini	"	8	143	42	"	2	"	2,860	39	..	61	
12	Angus	"	1	136	47	"	3¼	Bald ...	4,870	38	50	60	Slightly.
13	Norval	Aug.	29	133	49	"	4	Bearded	5,375	38	45	61½	"
14	Red Fife	Sept.	7	142	50	"	3½	Bald ...	4,090	38	30	57½	"
15	Hastings	"	7	142	48	"	3¼	" ...	4,900	38	20	60	Considerably.
16	Advance	"	7	142	48	"	3½	" ...	5,920	38	..	58	Slightly.
17	Alpha	"	1	136	48	"	3½	Bearded	3,060	37	40	57	"
18	Australian No. 27	*	....	* ..	51	"	4¼	Bald ...	5,585	37	35	56	"
19	Crawford	Aug.	29	133	45	"	3	" ...	3,685	37	15	61	"
20	Crown	Sept.	4	139	49	"	3½	" ...	6,320	37	..	57½	"
21	Benton	"	3	138	48	"	3	" ...	5,610	36	30	62	"
22	Percy	"	1	136	53	"	4	" ...	3,570	36	30	56	"
23	Laurel	*	....	* ..	46	Medium	4	" ...	5,560	36	20	54	
24	Chester	Sept.	1	138	46	Strong..	3½	" ...	5,025	36	15	61	
25	Goose	"	6	141	46	"	2½	Bearded	2,630	36	10	61½	
26	White Fife	"	6	141	48	"	3¼	Bald ...	4,435	36	5	59	
27	Clyde	Aug.	29	133	50	"	3½	" ...	4,840	36	..	60½	
28	Countess	"	29	133	46	"	2¾	" ...	5,590	35	50	60½	"
29	Colorado	Sept.	3	138	46	"	3	Bearded	4,075	35	25	61	
30	Byron	Aug.	29	133	44	"	3	"	3,880	35	20	62	"
31	Herisson Bearded	*	....	* ..	46	Medium	2	"	6,400	35	20	58½	
32	Early Riga	Aug.	25	129	45	Strong..	2¾	Bald ...	4,110	35	10	60¼	Considerably.
33	White Connell	Sept.	6	141	49	"	3½	" ...	4,700	35	..	57½	
34	Monarch	"	4	139	47	"	3	" ...	4,060	35	..	57	Slightly.
35	Plumper	"	1	136	45	"	3¼	Bearded	4,710	34	50	61	"
36	Girgeh	Aug.	25	129	30	"	2¼	"	4,310	34	50	51	"

SPRING WHEAT—TEST OF VARIETIES—*Concluded.*

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.		
37	Progress	Sept. 1	136	46	Strong..	3	Bald ...	4,910	34	30	58	Considerably.
38	Red Fern..	" 7	142	49	" .	4¼	Bearded	5,710	34	10	57	Slightly.
39	Blair	Aug. 29	133	43	" .	2¾	Bald ...	3,090	33	50	62	Considerably.
40	Australian No. 19....	* ...	* ..	51	" .	3¼	" ...	5,215	33	45	53½	Slightly.
41	Dawn..............	Aug. 28	132	43	" .	3	" ...	5,480	33	40	59½	"
42	Cartier......... ..	" 29	133	45	" .	2¾	Bearded	2,950	33	30	62½	"
43	Wellman's Fife	Sept. 7	142	51	" .	4½	Bald ...	2,650	33	10	57½	"
44	Admiral.......	" 1	136	49	" .	3½	Bearded	3,250	32	30	61	
45	Minnesota No. 149 ..	*	* ..	48	" .	3½	Bald ...	5,490	32	20	58	
46	Essex.	*	* ..	50	" .	4	" ...	5,300	32	20	55	Considerably.
47	Australian No. 9.....	*	* ..	51	" .	4	" ...	3,880	32	..	57	
48	White Rnssian	*	* ..	48	" .	3½	" ...	4,890	31	50	55	Slightly.
49	Rio Grande	Sept. 7	142	51	" .	4½	Bearded	3,630	31	30	56¼	
50	Australian No. 25....	*	* ..	48	" .	4	Bald ...	5,745	31	15	54	"
51	Cassel..	Sept. 1	136	52	" .	3¾	" ...	4,645	30	55	61	
52	Robin's Rust-proof...	" 1	136	47	" .	3½	Bald ...	3,550	30	50	62½	"
53	Minnesota No. 181...	*	* ..	49	" .	3½	" ...	5,835	30	25	57	"
54	Red Swedish.......	*	* ..	49	Weak ..	4	Bearded	5,520	29	20	58	
55	Bishop....	Sept. 1	136	46	Strong..	3¼	Bald ...	4,065	28	15	61½	"
56	Japanese...........	Aug. 26	130	42	" .	2¾	Bearded	4,840	27	40	57	"
57	Minnesota No. 163...	*	* ..	51	" .	3½	Bald ...	7,880	27	..	54½	"
58	Australian No. 23....	*	* ..	52	" .	3½	" ...	5,385	26	55	53	"
59	Australian No. 10....	*	* ..	48	" .	3½	" ...	5,295	26	45	55	"
60	Vernon......	Sept. 1	136	45	" .	3	Bearded	6,270	25	30	57	Considerably.
61	Australian No. 13....	*	* ..	50	" .	3¾	Bald ...	5,005	22	35	52	Slightly.
62	Minnesota No. 169...	*	* ..	54	" .	4¾	" ...	5,205	21	35	49	"

*These varieties were not fully ripe, but were cut on Sept. 8 on account of frost. They would have required 4 or 5 days more to ripen. The number of days from sowing to cutting was 143.

WHEAT.

TEST OF VARIETIES IN FIELD LOTS.

In this test nine varieties were used. On account of very strong winds, the varieties could not be all sown on the same day. The field used was uniformly even in soil, and had been fallowed the previous year. The cultivation consisted of one deep ploughing (seven to eight inches) in May, and four cultivations during the growing season. Two to three inches on top were stirred after the first ploughing, iron harrows, spring-tooth cultivator and three-furrow ploughs being used. One and one-half bushels seed was sown per acre, by hoe drill, with no harrowing or cultivating before or after seeding. Soil, clay loam.

WHEAT—FIELD LOTS.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.
	Acres				In.		In.		Bush.	Lbs.	Lbs
Huron	1	April 16....	Aug. 31....	137	49	Strong ...	3½	Bearded..	40	24	62
Monarch	⅓	" 16....	Sept. 2....	139	50	Medium..	3¾	Bald	38	19	59
Preston	4	" 14....	Aug. 29....	137	53	Strong ...	3¼	Bearded..	38	..	62½
Laurel	⅓	" 15....	Sept. 7....	144	52	" ...	4	Bald	37	56	59½
Stanley	3	" 14....	Aug. 29....	137	52	" ...	3½	"	37	18	61
Red Fife...... .	10	" 9....	Sept. 4....	148	50	" ...	4	"	35	49	61
Wellman's Fife....	4	" 9....	" 7....	151	53	" ...	4	"	35	10	60
White Fife........	⅓	" 16....	" 7....	144	51	" ...	3½	"	34	50	57½
Percy	3	" 14....	Aug. 31....	139	53	" ...	3½	"	30	18	59

WHEAT CROP AND AVERAGE YIELD.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Huron	Fallow	1	40	24	40	24
Monarch	"	$\frac{1}{3}$	38	19	12	46
Preston	"	4	38	..	152	..
Laurel	"	$\frac{1}{3}$	37	56	12	38
Stanley	"	3	37	18	111	54
Red Fife	"	10	35	49	358	15
Wellman's Fife	"	4	35	10	140	40
White Fife	"	$\frac{1}{3}$	34	50	11	36
Percy	"	3	30	18	90	54
		26			931	7

Or an average of 35 bush. 48 lbs. per acre.

SPRING WHEAT.

TEST OF FERTILIZERS.

Six plots of one-fortieth acre each were sown May 14. Five of these were treated with artificial manures, and the sixth used as a check plot. They were sown with Red Fife wheat, by hoe-drill, at the rate of 1½ bushels per acre.

All plots in this test were so badly injured by rust that results of any value could not be obtained. Apparently there was no difference in the growth of straw. The check plot was as badly injured as those on which fertilizers were used. The land used for this test was summer-fallow; soil, clay loam.

WHEAT—TEST OF FERTILIZERS.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Rusted.
				In.		In.		
Plot No. 1—Nitrate of soda, 100 lbs. per acre (half sown when grain was 2 in. high, balance when 6 in. high)	May 14.	Sept. 1.	110	46	Strong....	4	Bald..	Badly injured by rust.
Plot No. 2—Nitrate of soda, 200 lbs. per acre (half sown when grain was 2 in. high, balance when 6 in. high)	" 14.	" 1.	110	46	"	4	" ..	"
Plot No. 3—Superphosphate No. 1, 400 lbs. per acre (sown before grain and harrowed)	" 14.	" 1.	110	46	"	4	" ..	"
Plot No. 4—Check plot, unfertilized	" 14.	" 1.	110	46	"	4	" ..	"
Plot No. 5—Muriate of potash, 200 lbs. per acre (sown before grain and harrowed)	" 14.	" 1.	110	46	"	4	" ..	"
Plot No. 6—Superphosphate No. 1, 200 lbs per acre; muriate of potash, 100 lbs. per acre; nitrate of soda, 100 lbs. per acre (half sown before grain and harrowed, and the balance when the grain was 2 in. high)	" 14.	" 1.	110	46	"	4	" ..	"

FALL WHEAT.

Two varieties were sown on October 7, 1902. The soil being dry, little or no growth took place before winter set in; and this spring, both sorts being dead, the land was re-sown with flax.

EXPERIMENTS WITH EMMER AND SPELT.

Two varieties of emmer and two of spelt were sown on one-twentieth or one-fortieth acre plots, and common emmer was also sown on one-quarter acre lot. They were sown on fallowed land, clay loam, by hoe-drill, at the rate of two bushels seed per acre.

SPELT AND EMMER—TEST OF VARIETIES.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel Measure.
	Acre.				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Common Emmer ('Speltz')	1·20	April 18	Sept. 8	143	47	Strong	2	Bearded	3,320	54	40	33¼
Red Emmer	1·40	" 18	" 8	143	49	"	2½	"	6,510	45	30	37
White Spelt	1·40	" 18	" 8	143	51	"	5	Bald	5,620	39	40	28
Black Bearded Spelt	1·40	" 18	" 8	143	50	"	5	Bearded	2,050	26	30	33
Common Emmer	¼	May 5	" 8	126	44	"	2	"	......	42	40	

In estimating the yields of these spelts and emmers, the bushel has been estimated at sixty pounds but no allowance has been made for the husk, which forms about twenty per cent of the total weight.

SUMMER-FALLOWS.

In view of the great importance of properly preparing land for crops, I make no excuse for repeating in this what was stated in last year's report respecting summer-fallows and breaking up and cultivating new prairie land.

While grain on fallows the past year was more or less injured by frost in early September, it must be borne in mind that August last was the worst ripening month in the past 16 years, and that had the last week of that month been at all favourable, the largest crop for years would have been obtained on fallowed land. Another point should be considered. A great many have lately been working their fallows shallow early in the season, and later on ploughing deep, which naturally leaves the soil loose and exposed to drying winds. In a fall like that of 1902, in which no rain fell during the entire season, such cultivation defeats one of the objects of making a fallow at all, namely, conserving moisture.

While Red Fife wheat, on properly fallowed land, in few instances was entirely ripe and cut when frost came, a good deal was nearly so, and suffered only in loss of one or at the most two grades; while all sown on fallows ploughed deep in the fall were greatly injured.

In many cases, the seed, although sown in April, did not germinate until May 20, the dry fall and deep ploughing being the cause.

It is gratifying to know that throughout the Territories, summer-fallowing is rapidly becoming general. No matter where farming is carried on, the farmers realize that to be sure of a crop they must prepare a portion of their land the year before the crop is grown, and apart from the value of the stored moisture, there is the inestimable advantage of keeping weeds from overrunning the farm.

The true worth of properly prepared fallows has been clearly demonstrated in past years in every grain-growing district of Assiniboia.

The work of preparing land for crop by fallowing is carried on in so many ways in different parts of the Territories, that perhaps a few words on some of the methods employed may be of help to at least some of the new settlers.

It has been observed in Alberta and Saskatchewan that the land to be fallowed is not, as a rule, touched until the weeds are full grown, and in many cases bearing fully matured seed. It is then ploughed.

By this method, which no doubt saves work at the time, the very object of a summer-fallow is defeated. In the first place, moisture is not conserved, because the land has been pumped dry by the heavy growth of weeds; and secondly, instead of using the summer-fallow as a means of eradicating weeds, a foundation is laid for years of labour and expense by the myriads of foul seeds turned under.

The endless fields of yellow-flowered weeds, generally Ball Mustard (*Neslia paniculata*), testify to the indifferent work done in many districts, and while no weed is more easily eradicated by a good system of fallows, there is no weed that is more easily propagated or takes greater advantage of poor work on fallows or on fall or spring cultivation.

As has been pointed out in my previous reports, early and thorough work on fallows is absolutely necessary to success, and I here repeat the methods and results of tests carried on for some years past.

First method.—Ploughed deep (6 to 8 inches) before last of June; surface cultivated during the growing season, and just before or immediately after harvest ploughed 5 or 6 inches deep.

Result.—Too much late growth if season was at all wet; grain late in ripening, and a large crop of weeds if grain was in any way injured by winds.

Second method.—Ploughed shallow (3 inches deep) before the last of June; surface cultivated during the growing season, and ploughed shallow (3 to 4 inches deep) in the autumn.

Result.—Poor crop in a dry year; medium crop in a wet year. Not sufficiently stirred to enable soil to retain the moisture.

Third method.—Ploughed shallow (3 inches) before the last of June; surface cultivated during the growing season, and ploughed deep (7 to 8 inches) in the autumn.

Result.—Soil too loose and does not retain moisture. Crop light and weedy in a dry year.

Fourth method.—Ploughed deep (7 to 8 inches) before the last of June; surface cultivated during the growing season.

Result.—Sufficient moisture conserved for a dry year, and not too much for a wet one. Few or no weeds, as all the seeds near the surface have germinated and been killed. Surface soil apt to blow more readily than when either of the other methods is followed. For the past fourteen years the best, safest and cleanest grain has been grown on fallow worked in this way, and the method is therefore recommended.

Fallows that have been ploughed for the first time after the first of July, and especially after July 15, have never given good results; and the plan too frequently followed of waiting till weeds are full grown, and often ripe, and ploughing under with the idea of enriching the soil, is a method that cannot be too earnestly advised against.

In the first place, after the rains are over in June or early in July, as they usually are, no amount of work, whether deep or shallow ploughing, or surface cultivation, can put moisture in the soil. The rain must fall on the first ploughing and be conserved by surface cultivation.

Weeds, when allowed to attain their full growth, take from the soil all the moisture put there by the June rains, and ploughing under weeds with their seeds ripe or nearly so, is adding a thousand-fold to the myriads already in the soil, and does not materially enrich the land.

BREAKING AND BACK-SETTING.

In view of the fact that every year brings to the Territories many new settlers, who are unacquainted with the methods of breaking up and preparing new land for crop, a few suggestions with regard to this very important work may not be amiss.

In all sections where the sod is thick and tough, breaking and back-setting should be done ; while in districts where scrub abounds and the sod is thin, deep breaking is all that is necessary.

The former is generally applicable to Assiniboia, and the latter to Alberta and Saskatchewan, especially to the northern parts of these Territories where the land is more or les scrubby..

SHALLOW BREAKING.

(To be back-set).

The sod should be turned over as thin as possible, and for this purpose a walking plough with a 12 or 14-inch share, is the best. When the breaking is completed (which should not be later than the second week in July), rolling will hasten the rotting process and permit back-setting to commence early in August.

BACK-SETTING.

Back-setting is merely turning the sod back to its original place, and at the same time bringing up two or three inches of fresh soil to cover it. The ploughing should be done in the same direction as the breaking and the same width of furrow turned. Two inches below the breaking is considered deep enough, but three or four inches will give better results.

After back-setting, the soil cannot be made too fine, and the use of disc or Randall harrow to cut up every piece of unrotted sod, will complete the work.

DEEP BREAKING.

Deep breaking, which in many sections of the country is the only practicable way of preparing new land, and which is, unfortunately, done in some instances where breaking and back-setting would give more satisfactory results, consists in the turning over of the sod as deeply as possible; usually from four to five inches.

When the sod has rotted, the top soil should be worked and made as fine as possible. The use of harrow and disc will fill up all irregularities on the surface, and make a fine, even seed-bed.

Whether the land is broken shallow or deep, it is necessary to have the work completed early, so as to take advantage of the rains which usually come during June or early in July. These rains cause the sod to rot, and without them, or if the ploughing is done after they are over, the sod remains in the same condition as when turned, and no amount of work will make up for the loss.

To some districts near the foot-hills of the mountains and in districts where scrub abounds and the sod is thin, these remarks may not apply; but as a rule, throughout the Territories, early breaking, whether deep or shallow is advisable.

WORKING LAND AFTER FIRST CROP.

Inquiries are often made as to what should be done after taking off the first crop on new land, the question being as to whether the land should be ploughed, or cultivated, or sown without any cultivation whatever.

This, however, can only be determined by circumstances. In districts with heavy clay soil, a satisfactory crop may be expected from burning the stubble of the former crop and sowing with or without cultivation; although a shallow cultivation after the stubble is burnt usually gives the best results.

In districts with light soils and especially with gravelly subsoil, cultivation before seeding is necessary.

After taking the second crop from breaking or back-setting, there can be no doubt that the land should be well fallowed to put it in proper condition for succeeding crops. If the fallow is well made and the process repeated every third year, the settler will have started on the right road to future success.

SMUT.

On acount of many new settlers coming into the country each year that can have no idea of the prevalence of smut, especially in the wheat crop, and the serious loss caused by this fungous disease, I submit the results obtained during the past years on this farm for their guidance.

No tests were carried on the past season, as in former years, as it was thought sufficient information had been gained to ensure the safety of all crops, whether wheat, oats or barley, from this dangerous enemy.

Burnt or stinking smut in wheat is a fungous disease that attacks the grain more or less each year, and where at all bad, the crop is rendered unsaleable, and with only a few heads affected, if threshed in damp weather, the grade and price are reduced. No district is proof against smut, and though more prevalent in some seasons than others, it is wise to guard against all danger from this source each year. Three remedies have been tried repeatedly; these are, treating the seed with Bluestone (Copper Sulphate), with Formalin and with Massel powder. Bluestone, from cheapness, ease in application and effectual cure, has proven the best for wheat, while formalin has given the best results with smut in oats and barley. While formalin is not more expensive than bluestone, the application is more difficult in the seed having to be soaked longer.

For wheat apparently free from smut, 1 pound of blustone crushed and dissolved in warm water and mixed with 10 gallons water, and the seed sprinkled with, or dipped in the solution, is sufficient for 10 bushels. For wheat at all affected, 1 pound bluestone to 5 bushels seed is required. The seed can be sprinkled or dipped as is most convenient, but, in sprinkling, care must be taken that every grain is wet with the solution.

For smut in oats or barley, 1 pound of formalin (which is a liquid), is sufficient for 50 bushels seed. If the seed is smutty the solution should be 8 or 9 ounces formalin to 10 gallons of water; if not smutty, 4½ ounces to the same quantity of water.

The seed should be soaked from 5 minutes to 2 hours, according to condition of grain and strength of solution.

EXPERIMENTS WITH OATS.

The oat tests, whether on small or large plots, gave good returns, with samples above the average. The land used in uniform tests and field lots had been fallowed the previous year, the cultivation consisting of one deep ploughing early in the spring, and surface cultivation afterwards. It will be seen that Banner oats gave much the best returns in field lots, and in the uniform test plots as well. This variety has in the past always given good yields, and without a doubt is a safe and satisfactory oat,—for Assiniboia at least.

OATS—FIELD LOTS.

Nine varieties were sown from 22nd to 29th April. Soil clay loam. All varieties, except Waverley, which occupied high land, were badly lodged in spots. Black Beauty was almost entirely down, and had to be cut from one way.

Number.	Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.
		Acres				In.		In.		Bush.	Lbs.	Lbs.
1	Banner............	5	April 25..	Aug. 25..	122	54	Strong ...	9	Branching	119	2	38
2	Abundance..........	3	" 27..	" 29..	124	56	"	9	" .	106	0	39
3	Wide Awake........	4	" 24..	" 25..	123	50	"	8	" .	98	14	40
4	Black Beauty.......	3	" 29..	" 31..	124	53	Weak....	9	" .	97	13	36¼
5	Thousand Dollar	2	" 28..	" 31..	125	56	Strong ...	9	" .	93	8	39
6	Goldfinder..........	4	" 25..	" 31..	128	56	" ..	9	" .	91	21	38
7	Improved Ligowo ...	5	" 25..	" 25..	122	54	"	8	" .	87	0	39½
8	Tartar King......	5	" 24..	" 22..	120	54	"	10	Sided.....	86	12	41
9	Waverley...........	5	" 22..	" 27..	127	53	" ...	9	Branching	82	3	40

OATS—TEST OF VARIETIES.

Forty-five varieties of oats were sown in this test. The plots were chiefly one-twentieth acre, with a few one-fortieth acre. They were sown on April 25, at the rate of 2 bushels of seed per acre. Nearly all the plots were lodged by rainstorms, but grain was well advanced, and no injury was done so far as the yield was concerned. The soil was a clay loam.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Banner	Aug. 27	124	54	Strong	8	Branching	4,350	136	26	41	Slightly.
2	Wide Awake	" 25	122	53	"	7	"	2,800	134	4	42	"
3	Thousand Dollar	" 25	122	52	"	10	"	3,325	132	27	43	
4	Lincoln	" 25	122	52	"	8	"	4,185	129	29	43	
5	Holstein Prolific	" 26	123	50	"	9	"	3,750	127	32	42	
6	Golden Beauty	" 25	122	52	"	10	"	5,380	127	2	41½	
7	Kendal White	" 29	126	53	"	9	"	4,000	127	2	41	
8	Buckbee's Illinois	" 26	123	50	"	8	"	3,965	126	31	41	
9	Bavarian	" 28	125	50	Weak	8	"	4,870	126	26	40½	"
10	Swedish Select	" 29	126	47	Strong	8	"	5,060	126	16	43½	
11	Improved American	" 25	122	53	"	8	"	4,340	125	10	42	
12	Irish Victor	" 26	123	56	"	9	"	2,225	123	33	42½	
13	American Triumph	" 28	125	51	"	9	"	2,680	123	18	41	
14	Golden Tartarian	" 29	126	50	"	11	Sided	3,180	122	32	41½	
15	Abundance	" 26	123	50	"	9	Branching	4,425	122	27	42½	
16	Black Beauty	" 26	123	47	Weak	8	"	4,180	122	12	37½	
17	Olive Black	" 31	128	57	Strong	11	Sided	4,500	121	26	40	"
18	White Giant	" 25	122	50	"	9	Branching	4,665	121	21	42	
19	Sensation	" 25	122	58	"	9	"	3,070	121	16	43	
20	Golden Fleece	" 31	128	52	"	10	"	5,890	120	30	41	"
21	Early Golden Prolific	" 29	126	56	Medium	8	"	5,280	120	..	42	"
22	Mennonite	" 26	123	51	Weak	10	"	4,730	119	24	42	
23	Milford White	" 29	126	58	Strong	11	Sided	4,580	119	14	41	
24	Golden Giant	" 29	126	48	"	10	"	3,820	118	18	40½	
25	Goldfinder	" 31	128	54	"	9	Branching	2,880	117	22	41	
26	Kendal Black	" 29	126	50	"	10	Sided	4,980	117	2	41	
27	Salines	" 27	124	53	"	11	Branching	3,975	116	1	40	
28	American Beauty	" 26	123	56	"	10	"	5,530	115	20	41	"
29	Pense White	" 29	126	54	"	10	Sided	3,360	115	10	41	"
30	Danish Island	" 25	122	51	"	8	Branching	5,450	115	..	42	
31	Pense Black	" 31	128	60	"	13	Sided	5,810	115	..	42	
32	Milford Black	" 29	126	50	"	11	"	5,100	114	24	41½	"
33	New Zealand	Sept. 5	133	54	Weak	11	"	2,610	112	22	41	
34	Columbus	Aug. 21	126	44	"	9	Branching	2,440	111	26	39	
35	Improved Ligowo	" 25	122	55	Strong	8	"	2,920	111	26	44¼	
36	Twentieth Century	" 25	122	50	"	8	"	2,480	110	20	42½	
37	Olive White	" 29	126	53	"	10	Sided	5,240	109	14	40	
38	Waverley	" 26	123	57	"	10	Branching	3,020	108	28	43½	
39	White Schonen	" 19	116	46	"	9	"	4,160	105	30	41½	
40	Joanette	" 30	127	47	Weak	9	"	5,000	104	19	40	
41	Pioneer	" 26	123	50	Strong	7	"	4,005	100	15	43½	
42	Scotch Potato	" 26	123	57	"	10	"	3,785	100	15	42	"
43	Tartar King	" 25	122	50	"	9	"	2,760	97	22	44½	
44	Wallis	" 28	125	55	"	9	"	4,480	97	22	42	
45	Siberian	Sept. 5	133	59	Weak	12	Sided	2,705	89	9	39	

TOTAL YIELD FROM FIELD CROPS OF OATS.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
					Bush.	Lbs.
Banner	Fallow	5	119	2	595	10
Abundance	"	3	106	..	318	
Wide Awake	"	4	98	14	393	22
Black Beauty	"	3	97	13	292	5
Thousand Dollar	"	2	93	8	186	16
Goldfinder	"	4	91	21	366	16
Improved Ligowo	"	5	87	..	435	
Tartar King	"	5	86	12	431	26
Waverley	"	5	82	3	410	15
		36			3,429	8

An average of 95 bushels 8 pounds per acre.

EXPERIMENTS WITH BARLEY.

The barley tests, whether grown on field lots or on small plots, gave good returns. Repeated rains and heavy dews coloured the grain, but otherwise the sample is good.

FIELD LOTS.

Mensury and Odessa were sown on Brome sod broken and back-set the previous year. The balance of the varieties were on fallowed land, cultivated the same as for wheat. Sidney, in addition to what was sown on fallow, was ploughed in on stubble land, 3 inches deep, for feeding purposes. Odessa came up thin on account of the soil being very dry when sown, which accounts for the yield being small. Soil clay loam.

BARLEY—FIELD LOTS.

Name of Variety	Cultivation.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.
		Acres.				Ins.		Inches.		Bush.	Lbs.	Lbs.
Royal	Fallow	2	Ap'l 25	Aug. 10	107	34	Strong	2½	6-rowed.	67	3	51
Claude	"	1	" 29	" 25	118	41	"	2½	"	66		50
Standwell	"	3	" 29	" 25	118	50	Medium	2¾	2-rowed.	63	20	53
Invincible	"	4	" 27	" 28	123	43	"	3¼	"	59	25	53
Mensury	Brome s	5	" 30	" 12	104	45	Strong	3	6-rowed.	56	12	49
Sidney	Fallow	6	" 30	" 21	113	46	"	3½	2-rowed.	54	20	52
Canadian Thorpe	"	4	" 28	" 21	115	50	"	3	"	53	39	52
Mansfield	"	1	" 29	" 25	118	44	"	2¾	6-rowed.	50		52
Odessa	Brome s	4	May 1	" 12	103	42	"	2½	"	48	28	51

BARLEY—UNIFORM TEST PLOTS.

Fifteen varieties of 2-rowed, and twenty varieties of 6-rowed barley were tested on one-twentieth or one-fortieth acre plots. The soil was clay loam. They were all sown on April 29, all the varieties came up evenly and gave large returns.

BARLEY, TWO-ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				Ins.		Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Standwell....	Aug. 22	115	51	Weak..	3	2-rowed..	2,520	80	40	54
2	Invincible..................	" 22	115	50	"	$3\frac{1}{4}$	" ..	4,900	77	14	54
3	French Chevalier	" 24	117	41	Medium	4	" ..	4,930	71	22	53
4	Canadian Thorpe.........	" 15	108	53	Strong..	3	" ..	4,150	71	2	$51\frac{1}{2}$
5	Danish Chevalier.........	" 24	117	40	Weak..	3	" ..	3,280	66	2	52
6	Gordon	" 14	107	51	Strong..	3	" ..	4,100	64	28	52
7	Sidney....................	" 15	108	46	" ..	$3\frac{1}{4}$	" ..	3,500	62	24	$54\frac{1}{2}$
8	Logan.......	" 12	105	48	" ..	3	" ..	4,810	62	14	$51\frac{1}{2}$
9	Jarvis....	" 15	108	50	" ..	3	" ..	4,430	61	22	50
10	Newton	" 22	115	48	Medium	3	" ..	3,470	61	2	53
11	Fulton.....................	" 10	103	55	Strong..	3	" ..	4,050	58	46	51
12	Harvey....................	" 10	103	50	" ..	$3\frac{3}{4}$	" ..	5,200	58	16	51
13	Clifford....................	" 12	105	50	" ..	3	" ..	5,250	57	14	51
14	Beaver..	" 19	112	40	Medium	3	" ..	5,460	56	12	52
15	Dunham	" 16	109	44	" ..	$3\frac{1}{4}$	" ..	6,220	52	14	$52\frac{1}{2}$

BARLEY, SIX-ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head	Weight of Straw.	Yield per Acre.		Weight per Bushel.
1	Odessa....................	Aug. 13	106	42	Strong..	$2\frac{1}{2}$	6-rowed...	1,900	71	12	$51\frac{1}{2}$
2	Claude....................	" 19	112	39	" ..	3	" ..	3,080	65	40	49
3	Trooper...................	" 17	110	40	" ..	$2\frac{3}{4}$	" ..	3,080	64	8	52
4	Mensury......	" 15	108	41	" ..	3	" ..	3,440	63	36	$50\frac{1}{2}$
5	Brome.....................	" 20	113	38	" ..	$2\frac{1}{2}$	" ..	3,100	63	26	52
6	Mansfield.................	" 15	108	41	" ..	$2\frac{1}{2}$	" ..	3,130	63	6	$52\frac{1}{2}$
7	Summit....................	" 20	113	40	" ..	3	" ..	3,760	61	2	53
8	Common......	" 13	106	37	" ..	2	" ..	2,800	60	20	53
9	Royal......................	" 17	110	38	" ..	$2\frac{1}{2}$	" ..	3,720	60	..	53
10	Rennie's Improved.........	" 13	106	37	" ..	2	" .	2,850	57	14	54
11	Empire.....................	" 20	113	39	" ..	3	" ..	4,120	56	32	$51\frac{1}{4}$
12	Argyle..........	" 18	111	42	" ..	$2\frac{1}{2}$	" ..	3,040	56	32	52
13	Garfield	" 18	111	40	" ..	$2\frac{1}{2}$	" ..	3,250	55	30	52
14	Oderbruch.................	" 14	107	39	" ..	$2\frac{1}{2}$	" ..	2,270	54	38	54
15	Nugent...	" 19	112	40	" ..	3	" ..	4,260	54	28	
16	Stella.........	" 19	112	38	" ..	3	" ..	2,865	54	3	$52\frac{1}{4}$
17	Yale.......................	" 19	112	40	" ..	$2\frac{1}{2}$	" ..	4,970	53	46	51
18	Albert.....................	" 15	108	39	" ..	$2\frac{3}{4}$	" ..	3,030	53	26	$53\frac{1}{2}$
19	Baxter........	" 15	108	42	" ..	2	" ..	3,580	50	20	53
20	Champion...	" 10	103	42	" ..	$2\frac{1}{2}$	" ..	3,000	45	20	48

BARLEY CROP AND AVERAGE YIELD.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Royal..	Fallow	2	67	3	134	6
Claude..	"	1	66	..	66	..
Standwell......................................	"	3	63	20	190	12
Invincible....	"	4	59	25	238	4
Mensury.........	Brome sod....	5	56	12	281	12
Sidney..	Fallow	6	54	20	326	24
Canadian Thorpe	"	4	53	39	215	12
Mansfield	"	1	50	..	50	..
Odessa..	Brome sod....	4	48	28	194	16
Total	....	30	....		1,695	38

An average of 56 bushels 25 pounds per acre.

EXPERIMENTS WITH PEASE.

Forty varieties of pease were sown on fallowed land, clay loam on one-twentieth acre plots, on May 5, at the rate of 2 bushels of small, 2½ bushels of medium and 3 bushels of large pease per acre. As will be seen, only four sorts were ripe when frost came. The balance matured afterwards, but were injured more or less.

All varieties were very heavy in straw, and well podded, but the cool, wet weather early in September delayed the ripening.

PEASE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre		Weight per Bushel.
					In.	In.		Bus.	lbs.	Lbs.
1	Early Britain	Sept. 8..	126	Strong...	53	2½	Medium ..	60	30	60½
2	Paragon	" 12..	130	"	54	3	" ..	60	..	61½
3	Gregory	" 12..	130	"	60	2½	" ..	59	10	62½
4	Mackay	" 14..	132	"	51	3	" ..	57	50	61
5	King	" 13..	131	"	48	2½	" ..	56	30	62
6	English Gray	" 8..	126	"	56	3	" ..	55	50	60
7	Prussian Blue	" 8..	126	"	50	2¾	Small.....	55	50	62
8	Macoun	" 13..	131	"	56	3	Medium ..	55	30	59
9	Wisconsin Blue	" 16..	134	"	60	2¾	Small	55	10	58½
10	Archer	" 10..	128	"	52	3	Medium ..	53	10	61½
11	Pride	" 10..	128	"	57	3	" ..	53	10	62½
12	Bruce	" 10..	128	"	53	2⅓	" ..	52	50	60
13	Black-eyed Marrowfat	" 10..	128	"	48	2¾	" ..	50	30	62
14	Alma	" 16..	134	"	54	2½	Small	50	10	63½
15	Carleton	" 16..	134	"	65	2½	"	49	50	60
16	Kent	" 14..	132	"	58	3	Medium ..	49	10	62
17	New Potter	" 10..	128	"	52	2¼	" ..	49	10	61
18	German White	" 8..	126	"	48	2½	" ..	49	10	64½
19	Picton	" 6..	124	"	48	2½	" ..	48	30	62½
20	Perth	" 6..	124	"	55	2½	" ..	47	50	61½
21	Agnes	" 6..	121	"	50	2½	" ..	46	50	62½
22	Elliot	" 10..	128	"	56	2½	" ..	46	50	61
23	Nelson	" 8..	126	"	50	2½	" ..	45	30	62
24	Pearl	" 8..	126	"	53	2½	" ..	45	30	62
25	Duke	" 15..	133	"	57	3	" ..	45	10	62½
26	Prince	" 8..	126	"	50	2¾	Large	45	10	63½
27	Lanark	" 8..	126	"	50	2½	"	44	50	63
28	Centennial	" 8..	126	"	50	3	Medium ..	44	50	60½
29	Fergus	" 16..	134	"	63	2¼	" ..	44	30	53
30	Large White Marrowfat	" 6..	124	"	57	2¾	Large ..	43	30	62½
31	Arthur	" 6..	124	"	48	2¼	"	42	10	65
32	Daniel O'Rourke	" 3..	121	"	50	2¼	Small	41	10	62
33	Crown	" 3..	121	"	52	2	"	40	50	63
34	Trilby	" 14..	132	"	56	3	Medium ..	39	50	63
35	Golden Vine	" 3..	121	"	47	2	" ..	39	10	64
36	Victoria	" 10..	128	"	60	2½	" ..	38	10	60¼
37	Chancellor	" 6..	124	"	50	2½	" ..	37	30	63
38	Mummy	" 6..	124	"	50	2¼	Small	37	30	62½
39	Prince Albert	" 8..	126	"	60	2½	"	37	30	61
40	White Wonder	Aug. 28..	115	"	46	2¼	Medium ..	31	30	62

ROTATION OF CROPS.

The rotation tests which were commenced in 1899, were continued this year.

All land was ploughed in fall of 1902 that had been in crop that year, and the five half acres of beans, pease, tares and clovers had been ploughed as these crops attained their greatest growth, and all harrowed and put in as good condition as the dry state of the soil would permit.

The grain of the stubble half acres came up very thin, and though the rains in May caused a second germination, the crop was a very light one. Rust also struck the wheat plots, causing a very small yield.

The following rotation has been carried out since 1899.

ROTATION OF CROPS.

No.	1899.	1900.	1901.	1902.	1903.
1	Wheat..........	Oats..............	Soja Beans.........	Wheat...........	Oats..............
2	"	Wheat..........	Pease..............	"	Wheat.........
3	"	Oats..............	Tares..............	"	Oats..............
4	"	Wheat..........	Red Clover.........	"	Wheat............
5	"	Barley...........	Alsike and Lucerne..	"	Barley............
6	Pease............	Wheat..........	Wheat.............	Pease............	Wheat............
7	Tares.............	"	Oats.............	Tares............	" ....
8	Soja Beans........	"	"	Soja Beans........	" ....
9	Red Clover........	"	Wheat.............	Red Clover........	" ....
10	Alsike & Lucerne..	"	Barley............	Alsike & Lucerne..	" ....
11	Rape.............	"	Summer-fallow......	Rape.............	" ....
12	Wheat..........	"	"	Wheat...........	" ....
13	"	Oats..............	"	"	Oats..............
14	"	Barley...........	"	"	Barley............
15	"	Wheat..........	Oats.............	"	Wheat............
16	"	Barley...........	"	"	Barley............
17	Oats.............	Soja Beans........	Wheat.............	Oats.............	Soja Beans.........
18	Wheat..........	Pease............	"	Wheat...........	Pease............
19	Oats.............	Tares............	"	Oats.............	Tares............
20	Wheat..........	Red Clover........	"	Wheat...........	Red Clover.......
21	Barley...........	Alsike & Lucerne..	"	Barley...........	Alsike & Lucerne..
22	Rye,.............	Summer-fallow....	"	Rye.............	Summer-fallow....

ROTATION TEST.—Results obtained in 1903. Plots, ½ acre each. Soil, clay loam.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Rusted.
					In.		In.		Bus.	lbs.	
1	Oats, Banner..........	April 29	Aug. 20	113	47	Strong..	9	Branching..	47	12	
2	Wheat, Red Fife.......	" 15	" 31	138	41	" .	3	Bald........	16	2	Badly.
3	Oats, Banner..........	" 29	" 29	122	39	" .	9	Branching..	43	18	
4	Wheat, Red Fife.......	" 15	" 31	138	40	" .	3½	Bald.... .	15	30	"
5	Barley, Canad'n Thorpe.	" 29	" 28	121	39	" .	2¾	Two-rowed..	20	40	
6	Wheat, Red Fife.......	" 15	Sept. 8	146	43	" .	3¼	Bald........	24	8	Considerably.
7	" "	" 15	" 8	146	44	" .	3½	"	24	28	"
8	" "	" 15	" 8	146	43	" .	3½	"	22	58	"
9	" "	" 15	" 8	146	43	" .	3½	"	20	52	"
10	" " ..	" 15	" 8	146	44	" .	3¼	"	23	14	"
11	" "	" 15	" 8	146	43	" .	3½	"	20	20	"
12	" " .. .	" 15	Aug. 21	128	45	" .	4	"	14	16	Badly.
13	Oats, Banner..........	" 29	" 20	113	38	" .	8	Branching..	42	12	
14	Barley, Canad'n Thorpe.	" 29	" 18	111	36	" .	2½	Two-rowed..	18	36	
15	Wheat, Red Fife.......	" 15	" 31	138	45	" .	3½	Bald........	15	40	Considerably.
16	Barley, Canad'n Thorpe.	" 29	" 28	121	37	" .	3	Two-rowed..	20	..	
17	Soja Beans............	May 16	Ploughed under, Aug. 5				....	....	....		
18	Pease.................	" 21	" July 28				....	....	....		
19	Tares.................	" 21	" Aug. 5				....	....	....		
20	Red Clover............	" 16	" Oct. 21				....	....	....		
21	Alsike and Lucerne....	" 16	" " 21				....	....	....		
22	Summer-fallow........	....	....				....	....	....		

EXPERIMENTS WITH FLAX.

Several tests as to quantity of seed per acre, and different dates of seeding were made, but unfortunately the plots were on low ground, and very heavy rains destroyed the tests.

Two acres of Western Rye Grass sod, ploughed early in May were sown with flax on May 21, and harvested August 20. Yield per acre, 12 bushels.

Three-quarters of an acre of fallowed land was sown with flax on May 5. Ripe September 2. Yield per acre, 10 bushels.

EXPERIMENT WITH CANARY GRASS.

(Phalaris Canariensis).

Sown April 30 on one-twentieth acre plot of fallowed land. Cut September 8. Days to mature, 131 days. Straw, strong; 33 inches long. Weight of straw per acre, 3,960 pounds. Head, 1½ inches. Yield per acre, 29 bushels 20 pounds. Weight per bushel, 48 pounds.

EXPERIMENT WITH SUNFLOWERS.

Russian variety, sown May 22. Produced heads, but no seed had formed when frost came and destroyed the crop.

EXPERIMENT WITH TARES.

One-twentieth acre of fallowed land was sown with tares on May 5; ripe September 10; days to mature, 128; length of straw, 40 inches; pod, 2¼ inches. Yield per acre, 24 bushels 10 pounds. Weight per bushel, 54 pounds.

EXPERIMENTS WITH MILLETS.

Six varieties were sown on May 16, on one-twentieth or one-fortieth acre plots of fallow. Did not mature. Cut for feed on September 5, on account of frost. Two varieties did not germinate and were ploughed up.

Variety.	Size of Plot.	Height	Yield per Acre.	
	Acre.	Inches.	Tons.	Lbs.
Hungarian	1-20	43	6	...
White Round French	1-40	50	6	...
Italian	1-40	43	4	...
Red Orenburg	1-40	46	3	800
Algerian	1-40	Did not germnate.		
Pearl	1-40			

EXPERIMENTS WITH SOJA BEANS.

Sown May 16, on fallowed land. No pods formed.

Variety.	Rows Distance Apart.	Height.	Yield per Acre. (Green.)	
	Inches.	Inches.	Tons.	Lbs.
Soja beans	21	20	3	1,544
"	28	20	2	1,668
"	35	21	1	1,393

Cutting Banner Oats at Indian Head.

EXPERIMENTS WITH HORSE BEANS.

Sown in drills on fallowed land on May 16.

Variety.	Rows Distance Apart.	Height.	Yield per Acre. (Green.)	
	Inches.	Inches.	Tons.	Lbs.
Horse beans	21	46	15	176
"	28	46	12	1,496
"	35	44	14	866

EXPERIMENT WITH FALL RYE.

Sown October 7, 1902, on one-twelfth acre plot of fallow. Ripe August 20. Straw, strong; 61 inches long. Head, 4½ inches long. Yield per acre, 46 bushels 20 pounds.

EXPERIMENT WITH SPRING RYE.

Sown April 18, on one-twentieth acre plot of fallow. Ripe August 22. Days to mature, 126. Straw, strong; 50 inches long. Head, 4 inches long. Weight of straw, 4,540 pounds per acre. Yield per acre, 38 bushels. Weight per bushel, 57 pounds.

HAY CROP.

The yield of Brome hay on account of the dry spring was small, but Western Rye Grass, which is later in starting and did not suffer so badly, gave satisfactory returns.

Alfalfa, which gave a small yield in first cutting, improved greatly through the wet weather of August, and the second cutting was better.

Timothy gave a good return.

YIELDS.

Brome Grass (*Bromus inermis*).

Fifteen acres Brome, second year.—Cut July 13 and 15; yield, 1 ton 733 lbs. per acre.

Western Rye Grass (*Agropyrum tenerum*).

Four acres, third year.—Cut July 13; yield, 2 tons 148 lbs. per acre.
Twelve acres, second year.—Cut July 22; yield, 2 tons 166 lbs. per acre.
Three acres, first crop.—Cut July 24; yield, 2 tons 1,530 lbs. per acre.

Alfalfa.

One-half acre.—First cutting, July 13; yield, 1,560 lbs. per acre. Second cutting, September 3; yield, 1 ton 252 lbs. per acre.

Timothy.

One-half acre.—Cut July 13; yield, 2 tons per acre.

Twenty-four acres of Brome Grass, first crop, was pastured.

Thirty acres of Brome Grass, which have been cut for hay from three to six years, were broken up, and a portion back-set and made ready for crop.

EXPERIMENTS WITH INDIAN CORN.

Twenty-four varieties of Indian corn were sown on May 22, in clay loam in drills 36 inches apart, and also in hills three feet apart each way. In addition, three varieties

were sown on May 27, in rows at different distances apart. The yield was computed from the weight of two rows, each 66 feet long.

The land was fallowed the previous year and 10 loads of well-rotted manure per acre spread over it after frost came, and cultivated in, as lightly as possible, before seeding.

The corn was cut on September 8 and 9, and cut up and put in silo after wilting two or three days. In addition to the experimental tests, six acres were sown for ensilage.

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	Date of sowing.	Character of Growth.	Height.	Condition when cut.	Weight per Acre grown in rows.		Weight per Acre grown in hills.	
				In.		Bush.	Lbs.	Bush.	Lbs.
1	Angel of Midnight..........	May 22.	Very strong.	77	Early milk ...	25	600	22	
2	Eureka	" .	Strong......	80	Tassel.......	20	700	19	1,600
3	Yellow Dakota Flint........	" .	"	70	Early milk ...	20	700	17	1,200
4	Longfellow.................	" .	"	72	" ...	19	1,600	18	1,400
5	North Dakota White........	" .	"	75	Tassel........	19	500	18	1,400
6	Salzer's All Gold...........	" .	" ...	78	"	19	500	21	1,560
7	Early Mastodon	" .	" ...	77	"	18	300	13	400
8	Mammoth 8-rowed Flint	" .	"	75	Early milk ...	18	300	18	1,400
9	Rural Thoro'bred White Flint	" .	"	73	Not in tassel..	18	300	22	1,100
10	Compton's Early............	" .	"	70	Early milk ...	17	1,200	13	1,500
11	Superior Fodder............	" .	"	71	Not in tassel..	16	1,000	14	1,700
12	Sanford......	" .	"	70	Early milk ...	16	560	16	1,000
13	Early Butler......	" .	"	77	Tassel........	15	1,900	15	800
14	King Philip......	" .	"	70	"	15	1,900	14	600
15	Giant Prolific Ensilage.....	" .	"	74	"	19	800	13	1,400
16	Champion White Pearl.....	" .	"	70	"	14	1,700	13	400
17	White Cap Yellow Dent	" .	"	70	Early milk ...	14	1,700	15	800
18	Mammoth Cuban............	" .	"	70	Tassel........	13	1,500	13	400
19	Pride of the North..........	" .	"	80	"	13	1,500	13	400
20	Selected Leaming........	" .	"	67	"	13	400	13	400
21	King of the Earliest.........	" .	"	77	Early milk ...	12	1,300	12	200
22	Evergreen Sugar...........	" .	"	65	Tassel........	12	1,300	12	200
23	Cloud's Early Yellow.......	" .	Medium....	67	"	11	1,100	11	
24	Red Cob Ensilage	" .	"	70	Not in tassel..	11	...	14	1,700

INDIAN CORN—TEST OF SEEDING AT DIFFERENT DISTANCES.

Sown in rows by grain seeder May 27; cut September 9. Cultivation of land the same as for preceding test.

Name of Variety.	Character of Soil.	Distance between rows.	Character of Growth.	Height.	Weight per Acre grown in rows.	
		Inches.		Inches.	Tons.	Lbs.
Longfellow............................	Clay loam ..	21	Strong..........	70	24	930
"	" ...	28	"	68	17	1,425
"	" ...	35	. ...	69	12	904
"	" ...	42	"	68	13	1,347
Champion White Pearl............	" ...	21	"	58	18	1,720
"	" ...	28	"	57	18	842
"	" ...	35	"	53	15	564
"	" ...	42	"	55	13	875
Selected Leaming	" ...	21	"	50	16	1,005
"	" ...	28	"	54	20	384
"	" ...	35	"	51	15	1,696
"	" ...	42	"	48	11	1,575

EXPERIMENTS WITH FIELD ROOTS.

Fallowed land, with 10 to 12 loads of well-rotted manure per acre, was used for the tests with field roots. The manure was evenly spread on the surface after frost came, and in the spring was lightly ploughed in with three-furrow ploughs. Soil, clay loam.

All varieties of turnips, mangels, beets and carrots came up evenly. The yield was obtained by weighing the roots in two rows 66 feet long and 30 inches apart.

EXPERIMENTS WITH TURNIPS.

Twenty-one varieties were sown on May 14, and again on May 26. Heavy rains soon after the first seeding delayed the second seeding longer than intended.

The Turnip-fly was troublesome, and did injury to the young plants; but the Turnip Moth, after the plants had been thinned out, destroyed great numbers, and retarded the growth greatly.

The turnips on both sets of plots were taken up on October 9.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Hall's Westbury	23	464	774	24	27	1,440	924	..
2	Perfection Swede	22	1,936	765	36	29	80	968	..
3	Jumbo	22	1,540	759	..	15	360	506	..
4	Skirving's	22	1,012	750	12	31	832	1,047	12
5	Mammoth Clyde	21	1,956	732	36	16	1,000	550	..
6	Drummond Purple-top	21	1,956	732	36	18	1,752	629	12
7	Selected Purple-top	20	1,580	693	..	18	488	624	48
8	Carter's Elephant	20	1,316	688	36	21	240	704	..
9	Shamrock Purple-top	19	1,792	663	12	19	1,600	660	..
10	Emperor Swede	19	544	642	24	26	8	866	48
11	Halewood's Bronze-top	19	148	635	48	26	1,328	888	48
12	Bangholm Selected	18	1,884	631	24	21	1,032	717	12
13	Imperial Swede	17	980	583	..	28	288	938	48
14	New Century	17	848	580	48	18	960	616	..
15	East Lothian	15	96	501	36	24	312	805	12
16	Good Luck	14	1,964	499	24	22	880	748	..
17	Magnum Bonum	13	400	440	..	23	1,520	792	..
18	Elephant's Master	12	948	415	48	23	1,520	792	...
19	Kangaroo	10	196	336	36	22	1,808	756	48
20	Hartley's Bronze	*		*		32	152	1,069	12
21	Sutton's Champion	*		*		25	952	819	12

* First seeding destroyed by turnip fly.

EXPERIMENTS WITH MANGELS.

Sixteen varieties of mangels were sown on May 14 and 28 and taken up Octobe[r] 8. From the start all varieties did well.

MANGELS—TEST OF VARIETIES.

	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs
1	Giant Yellow Intermediate	33	1,716	1,128	36	28	496	941	36
2	Mammoth Yellow Intermediate	32	812	1,080	12	24	840	814	..
3	Lion Yellow Intermediate	32	152	1,069	12	17	1,704	595	4
4	Giant Yellow Globe	29	1,796	996	36	30	720	1,012	..
5	Half-long Sugar White	29	1,796	996	36	17	1,968	597	8
6	Gate Post	29	1,400	990	..	19	1,600	660	..
7	Yellow Globe Selected	29	80	968	..	19	608	643	28
8	Prizewinner Yellow Globe	28	1,948	965	48	18	1,552	025	52
9	Yellow Intermediate	28	892	948	12	26	800	880	..
10	Selected Mammoth Long Red	28	496	941	36	26	1,064	884	24
11	Half-long Sugar Rosy	27	516	908	36	18	1,024	617	4
12	Prize Mammoth Long Red	26	1,592	893	12	25	1,480	858	..
13	Triumph Yellow Globe	26	800	880	..	24	576	809	36
14	Mammoth Long Red	26	536	875	36	29	1,064	994	24
15	Giant Sugar	25	1,480	858	..	24	1,104	818	24
16	Leviathan Long Red	24	1,236	820	36	27	1,176	919	36

EXPERIMENTS WITH SUGAR BEETS.

Eight varieties were tested. The first seeding was made May 15, and the second on May 26, and the roots from both were pulled October 9.

SUGAR BEETS.—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Improved Imperial	26	866	881	6	28	1,024	950	24
2	Royal Giant	26	866	881	6	18	828	613	48
3	Red Top Sugar	25	1,559	859	19	22	1,144	752	24
4	Danish Red Top	24	1,896	831	36	22	1,144	752	24
5	Danish Improved	21	1,956	732	36	23	1,520	792	..
6	French 'Very Rich.'	21	1,243	720	43	14	1,700	495	..
7	Vilmorin's Improved	21	1,005	716	45	29	1,400	990	..
8	Wanzleben	21	886	714	46	21	1,956	732	36

EXPERIMENTS WITH CARROTS.

Eleven varieties were tested. The first seeding was made May 2, and the second May 16 and both were pulled October 12. Although the land was fallowed, manured and cultivated the same as for mangels and other roots, the yield in all varieties was small.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Half-long Chantenay	12	684	411	24	10	1,912	365	12
2	Early Gem	11	1,892	398	12	8	1,160	286	..
3	Ontario Champion	10	64	334	24	9	1,800	330	..
4	Improved Short White	9	1,404	323	24	9	1,800	330	..
5	White Belgian	9	1,140	319	..	10	1,120	352	..
6	Long Yellow Stump-rooted	9	1,140	319	..	8	1,688	294	48
7	Giant White Vosges	9	1,008	316	48	12	1,080	418	..
8	New White Intermediate	9	876	314	36	11	704	378	24
9	Carter's Orange Giant	8	1,820	297	..	9	1,800	330	..
10	Mammoth White Intermediate	8	500	275	..	8	1,160	286	..
11	Half-long White	7	652	244	12	9	1,272	321	12

EXPERIMENTS WITH POTATOES.

Fifty-five varieties of potatoes were tested this year. The land used was fallowed in 1902. It was clay loam and was manured after frost came, the same as for all roots. The sets were dropped in drills 30 inches apart on May 14, and the crop was dug October 5. The yield per acre was obtained by weighing the potatoes from one row 66 feet long.

All the varieties gave large yields, with few or no small tubers.

POTATOES—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Growth.	Average Size.	Total Yield per Acre.		Form and Colour.
				Bush.	Lbs.	
1	Carman No. 1	Strong	Large	711	28	Long, white.
2	Early Sunrise	"	"	649	52	" red.
3	Early St. George	"	"	631	24	" pink.
4	Lee's Favourite	"	Medium	603	40	Oval, red.
5	Holborn Abundance	"	Large	597	31	Round, white.
6	Rose No. 9	"	Medium	597	31	Oval, red.
7	Empire State	"	"	597	31	" white.
8	American Wonder	"	Large	585	12	" "
9	Canadian Beauty	"	Medium	585	12	" pink.
10	Early Andes	"	"	575	57	" red.
11	Everett	"	Large	575	57	Long "
12	Prolific Rose	"	Medium	563	38	" pink.
13	American Giant	"	"	560	33	Oval, white.
14	Uncle Sam	"	Large	554	24	" "
15	Swiss Snowflake	"	"	554	24	Round "
16	Maule's Thoroughbred	"	"	551	19	Long, red.
17	Burnaby Seedling	"	"	548	14	" pink.
18	Burpee's Extra Early	"	"	542	4	Oval "
19	I. X. L	"	Medium	542	4	Long "
20	Rochester Rose	"	Large	542	4	" red.

POTATOES—TEST OF VARIETIES—*Concluded.*

Number.	Name of Variety.	Character of Growth.	Average Size.	Total Yield per Acre. Bush.	Lbs.	Form and Colour.
21	Delaware	Strong	Medium	535	55	Oval, white.
22	Penn Manor	"	Large	530	50	Long, red.
23	Seedling No. 7	"	Medium	523	36	Oval "
24	Country Gentleman	"	Large	523	36	Long, pink.
25	Late Puritan	"	Medium	517	26	" white.
26	Vanier	"	Large	514	21	" red.
27	General Gordon	"	"	511	16	Oval "
28	Early Norther	"	"	508	12	" "
29	Sharpe's Seedling	"	"	508	12	Long, pink.
30	Enormous	"	"	508	12	" white.
31	State of Maine	"	"	508	12	Oval "
32	McIntyre	"	Medium	498	57	Long, blue.
33	Troy Seedling	"	Small	492	48	Oval, white.
34	Early Michigan	Medium	Large	489	43	" "
35	Early Rose	"	"	489	43	Long, pink.
36	Irish Daisy	Strong	Medium	483	33	Round, white.
37	Dreer's Standard	"	"	480	28	Long "
38	Vick's Extra Early	"	"	477	24	Oval, pink.
39	Early White Prize	Medium	"	468	9	" white.
40	Sabean's Elephant	Strong	Large	455	50	" "
41	Reeve's Rose	"	Medium	455	50	Long, red.
42	Early Puritan	Medium	"	446	36	Oval, white.
43	Irish Cobbler	Strong	Large	443	31	" "
44	Rawdon Rose	"	"	434	16	" pink.
45	Cambridge Russet	"	"	428	7	Long, red.
46	Carman No. 3	"	"	428	7	" white.
47	Moneymaker	"	"	403	28	Oval "
48	Clay Rose	"	"	391	7	Round, red.
49	Brown's Rot-proof	"	Medium	385	..	Oval, round.
50	Green Mountain	"	Large	369	36	Long, white.
51	Pingree	Medium	Medium	357	16	" "
52	Pearce	"	Large	357	16	" pink.
53	Bovee	Strong	Medium	351	7	Oval "
54	Early Envoy	Medium	Large	326	28	Long, red.
55	Up to Date	Strong	Medium	267	57	Oval, white.

SUMMARY OF CROPS, 1903.

	Bushels.
Wheat:	
9 varieties, 26 acres	931
10 half acres, rotation test	98
62 uniform test plots	90
	1,119
Oats:	
9 varieties, 36 acres	3,429
5 acres Banner, not threshed	500
3 acres mixed feed, not threshed (on stubble)	200
3 half acres, rotation test	66
45 uniform test plots	254
	4,449
Barley:	
9 varieties, 30 acres	1,695
3 acres mixed feed	100
3 half acres, rotation test	34
35 uniform test plots	87
	1,916

	Bushels.	
Pease:		
40 uniform test plots	95	
1 acre	40	
	135	
Flax	28	
Rye	6	
Speltz	10	
	44	
	Tons.	Lbs.
Corn, ensilage	70	
Hay:		
Brome grass	20	
Western Rye grass	41	
Timothy	1	1,612
Alfalfa	2	
Cut in coulees, about	10	
	144	1,612
	Bushels.	
Roots, about	2,000	
Potatoes	100	
	2,100	

VEGETABLE GARDEN.

The vegetables grown in the past season were not satisfactory in all cases. Beans after they were up were injured by frost, and the growth retarded so much that few varieties ripened. Cucumbers, citrons, melons, pumpkins, squash and tomatoes were as unsatisfactory as the beans, from the same cause. Onions continued growing too long, and had not fully matured when they had to be taken up. Corn produced no ears ready for the table before frost came.

The remainder of the vegetables were good.

ASPARAGUS.

Barr's Mammoth, Barr's Elmira and Conover's Colossal were in use from May 17 to July 11. Did not do well at first, but after rains came produced a fair crop.

BEANS.—Sown in open, May 11.

Imported Seed.	In use Green.	Remarks.
Dwarf Black Speckled	....	Killed by frost in June.
Emperor of Russia	....	" "
Dwarf Extra Early	....	" "
Fame of Vitry	....	" "
Golden Skinless	....	" "
Dwarf Inexhaustible	....	" "
Experimental Farm Seed.		
Haricot, Inexhaustible	Aug. 12	Frozen before maturity.
" Matchless	" 3	Matured.
Black Speckled	" 7	Frozen before maturity.
Golden Skinless	" 7	" "
Emperor of Russia	" 3	" "
Early Six Weeks	July 28	Matured.
Valentine Wax	Aug. 7	Frozen before maturity.
Fame of Vitry	" 7	" "
Dwarf Kidney	July 28	Matured.
Golden Wax	Aug. 3	"
Detroit Wax	" 1	"
Extra Early	July 28	"
Early Mohawk	" 30	"
Currie's Rust-proof	" 31	"
Challenge Black Wax	" 30	"

BEETS.

Sown, May 8; in use, August 5; lifted, October 3.
Blood Red Turnip Early, 701 bush. 48 lbs. per acre.
Egyptian Dark Flat Red Early, 810 bush., 42 lbs. per acre.
Nutting's Dwarf Improved Blood Red, 834 bush., 54 lbs. per acre.
Long Smooth Blood Red, 750 bush., 12 lbs. per acre.

BROCOLI.

Sown in hot-house March 30; transplanted, April 13; set out, May 20.
Extra Early White, did not mature.

BRUSSELS SPROUTS.

Dwarf Improved, sown March 30; set out May 20; did not mature.

CELERY.

Sown in hot-house, March 30; transplanted, May 6; set out, June 12; taken up, October 9.

Name of Variety.	In use.	Weight of Single Plants.
		Lbs.
Rose-ribbed Paris	Oct. 1	$1\frac{3}{4}$
Paris Golden Yellow	Sept. 5	$1\frac{3}{4}$
Red Large-ribbed	Oct. 1	$2\frac{1}{3}$
Giant Pascal	" 9	$2\frac{3}{4}$

All varieties did well and produced an excellent crop.

CAULIFLOWER.

Sown in hot-house March 30; transplanted, May 13; set out, May 20.
Half Early Paris.—In use July 8; average weight, 5 lbs.
Extra Early Snowball.—In use June 30; average weight, 6 lbs.
Extra Early Dwarf Erfurt.—In use July 10; average weight, 5 lbs.

CARROTS.

Sown, April 22; lifted, October 8.

Name of Variety.	In use.	Yield per Acre. Bush.	Yield per Acre. Lbs.
Parisian Forcing Red	Aug. 5	290	24
Half-long Luc Stump-rooted	" 5	302	30
French Horn	" 5	266	12
Long Blood Red	" 5	314	36

Of fair size except French Horn carrots, which were very small.

CABBAGE.

Sown in hot-house, March 30; transplanted to frame, April 13; set out, May 20; taken up, October 13.

Name of Variety.	In use.	Average Weight. Lbs.	Remarks.
Extra Early Express	July 14	8	Good, solid heads.
" Midsummer Savory	Aug. 13	6	" heads.
Winningstadt Early	" 6	10	" solid heads.
Early Jersey Wakefield	July 28	9	Did well.
Paris Market	" 18	8	"
Fottler's Improved Brunswick	" 18	16	Very large heads.
Green Globe Savoy	" 18	10	Good heads.
Red Large Drumhead	" 18	12	"

GARDEN CORN.

Planted May 12. None ready for use before frost came.

Varieties Planted.—Crosby's Early Sweet; the Cory, in use September 12; Mitchell's Extra Early; Ringleader; Early White Cory, in use September 12; Squaw (Indian Head seed), very little germinated; Extra Early Premo. Pop-corn, White Pearl and Amber Rice, did not ripen.

CUCUMBERS.

Planted in hot-house, April 14; set out, May 28; sown in open, May 13; all frozen, September 5.

Varieties Sown.—Cool and Crisp, Everbearing, Improved White Spine.

CITRONS.

Sown in hot-house, April 14; set out, May 28; sown in open, May 13.
Preserving.—Green fruit, July 20; frozen, September 5.

LETTUCE.

Sown, May 17 and June 6.

Name of Variety.	First Seeding. In use	Second Sown.	Second Seeding. In use	Remarks.
Green Paris Cos	July 10	June 6	Aug. 10	Very fine large heads.
White Self-folding Cos	" 10	" 6	" 10	" "
Blonde Stone-head	June 24			Good heads.
Wheeler's Tom Thumb	" 24			"
Trocadero Red-edged	" 24			"
Early Ohio	" 24	June 6	July 28	"
All the Year Round	" 24	" 6	" 28	"
Red-edged Victoria	" 24			"
Neapolitan	" 30	June 6	Aug. 3	"

ONIONS.

Sown in hot-house, March 30; set out, May 28; lifted, September 24. Sown in open, April 22; lifted, September 24. Were not fully matured when taken up.

Name of Variety.	Yield per Acre, Sown in hot-house.		Yield per Acre. Sown in open.	
	Bush.	Lbs.	Bush.	Lbs.
Market Favorite	217	48	217	40
Trebon's Large Yellow	230	24	193	36
Danver's Yellow Globe	242	..	290	24
Large Red Wethersfield	266	12	242	..
Paris Silverskin	...	..	193	36

MELONS.

Sown in hot-house, April 14; set out, May 28; sown in open, May 13; frozen, September 5.

Musk Melons.—Earliest Ripe and Long Island, did not mature.

Water Melon.—Fourth of July did not mature.

PUMPKINS.

Sown in hot-house, April 28; set out, May 28; sown in open, May 13.

Large Yellow Field, New Japanese Pie and Sweet or Sugar did not mature; frozen, September 5.

SQUASH.

Sown in open, May 13.

White Bush Scalloped and Giant Crookneck did not mature; frozen, September 5.

TURNIPS.

Sown, May 13; in use, August 10; lifted, October 8.

Name of Variety.	Weight of Largest.	Yield per Acre.	
	Lbs.	Bush.	Lbs.
Extra Early White Milan	14	738	..
Early White Flat Strap-leaved	10	586	54
Robertson's Golden Ball	7	665	30
Early Stone	8	689	42

PEASE.

Sown, May 14.

Name of Variety.	In use Green.	Ripe.	Size.	Remarks.
Surprise	July 21..	Sept. 1..	Large	Good crop, early.
Stratagem	Aug. 7..	" 1..	"	"
Shropshire Hero	" 7..	" 10..	"	"
C. P. R.	July 26..	" 2..	"	"
Alaska	" 18..	Aug. 28..	Small	" "
Admiral	" 28..	Sept. 10..	"	Extra good crop.
Anticipation	" 28..	" 9..	Large	Good crop.
American Wonder	" 20..	" 1..	Medium..	Fair crop, early.
Burpee's Profusion	Aug. 1..	" 10..	" ..	Good crop.
Extra Early	July 18..	Aug. 28..	Small	Heavy crop, early.
Everbearing	Aug. 7..	Sept. 1..	Large	Good crop, early.
First of All	July 18..	Aug. 28..	Medium..	" "
First and Best	" 18..	" 28..	Small	Excellent crop, early.
Champion of England	Aug. 7..	Sept. 10..	Large	Good crop.
Horsford's Market Garden	July 20..	Aug. 28..	Medium..	" early.
Wm. Hurst	" 25..	Sept. 9..	Small	"
Gradus	" 18..	Aug. 28..	Large	" "
Laxton's Charmer	Aug. 3..	Sept. 1..	Medium..	"
Rural New Yorker	July 27..	Aug. 30..	" ..	"
Premium Gem	Aug. 1..	Sept. 9..	" ..	"
Yorkshire Hero	" 7..	" 10..	Large	"
Harrison's Glory	" 7..	" 10..	"	"
Nott's Excelsior	July 22..	" 8..	Medium..	" "
Queen	Aug. 7..	Aug. 30..	" ..	"
Daisy	" 7..	Sept. 10..	Large	"

RADISH.

Sown, May 8; in use, June 20. Second seeding, June 1; in use, July 2.

Early Scarlet Turnip, Forcing Scarlet Turnip, Forcing Deep Scarlet Extra Early, Early Deep Scarlet, French Breakfast, Scarlet White-tipped, Olive-shaped Scarlet.

Winter.—Scarlet China, Black Spanish.

All varieties did well in both seedings.

PARSNIPS.

Sown, May 8; ready for use, September 25; lifted, October 8.

Name of Variety.	Yield per Acre.		Remarks.
	Bush.	Lbs.	
Improved Hollow Crown	338	48	Did well, some fine roots.
The Student	447	42	" " "

TOMATOES.

Sown in hot-house March 30; transplanted to cold frame April 14; set out May 21.

Name of Variety.	In Use Green.	First Ripe.	Remarks.
The Ruby	July 20	Sept. 15	
Earliana	" 20	" 5	
Dominion Day	" 22		Did not ripen.
Earliest of All	" 18	Sept. 7	
New Earliana	" 24		"

PARSLEY.

Sown May 8; Champion Moss-curled; did well.

RHUBARB.

Old beds: Victoria, good crop; Linnaeus, good crop.

Seed sown in cold frame April 24; set out July 10; Victoria or Giant, Myatt's Linnaeus.

Roots from Experimental Farm, Brandon. Set out May 9:—

Early Prince.
Victoria.
Monarch Seedling.
Scarlet Nonpareil.
Royal Linnaeus.
Magnum Bonum.
Early Crimson.
General Taylor.
Fottler's Improved.
Prince Albert.
Paragon.
Brabant's Colossal.
Royal Albert.
Prince of Wales.
Strawberry.
Early Scarlet.
Salt's Perfection.
Tobolsk.

All varieties did well. There were some very fine stalks, some of which seeded.

COMMON SAGE.

Sown May 8; did well.

SUMMER SAVORY.

Sown May 8; did well.

SPINACH.

Large Round Viroflay; sown May 8; in use June 26; good crop.

THE FLOWER GARDEN.

The flower garden was extra good the past season. Pansies were never so fine, and continued in bloom up to November.

ANNUALS.—Propagated in hot-house. Sown March 23.

Variety.	Set out.	Bloom. From	Bloom. To	Remarks.
Abronia Umbellata	June 4	Aug. 5	Sept. 5	Very fine.
Ageratum, Dwarf Imperial Blue	" 4	" 5	" 5	Good border flower.
Agrostemma, Cóeli Rosa dwarf	" 4	July 15	" 5	Did well.
Amarantus Superbus	" 4	" 30	" 5	Fine plants.
Alyssum Benthami	May 28	" 15	" 5	Did well.
Antirrhinum, 3 varieties	" 26	" 20	" 5	Very fine.
Adonis Autumnalis	" 26	" 26	" 5	Small deep red flower.
Asters, 15 varieties	" 26	" 20	" 16	Did well. Fine blooms.
Bartonia Aurea	June 4	" —		Did not germinate.
Brachycome iberidifolia	" 4	June 20	Sept. 5	Did well.
Candytuft	May 26	" 20	" 5	Made good show.
Calendula, Royal Marigold	" 26	" 15	" 16	" "
Chrysanthemum, Tricolor	" 26	" 25	" 16	Good show.
" Coronarium	" 26	July 1	" 16	"
Clarkia, 2 varieties	" 26	June 23	" 5	"
Centaurea Margarita	" 26	" 6	" 5	"
Coreopsis Drummondii	" 26	" 11	" 5	"
" tinctoria	" 26	" 15	" 5	"
Celosia, 3 varieties	" 26	" 25	" 5	"
Dianthus, 7 varieties	" 27	July 6	" 16	Some extra fine blooms.
Daisy, double mixed	June 4	" 1	" 5	Bloomed well.
Gypsophila viscosa	May 26	June 20	" 5	Did well.
Godetia, 4 varieties	" 26	Aug. 5	" 5	Did well. Good show.
Gaillardia picta, 2 varieties	" 26	July 11	" 16	Very fine.
Helianthus, 2 varieties	" 27	" 25	" 5	Did well.
Hollyhock, 2 varieties	" 27	" 28	" 5	Some fine plants.
Helichrysum, double dwarf	" 27	" 10	" 5	Fine flowers.
Iberis Gibraltarica	" 28	" —		Did not bloom.
Impatiens Balsamina, double	" 27	" —	Sept. 5	Frozen June 10.
Linum Grandiflorum	" 28	June 20	" 5	Some fine blooms.
Lupins, 5 varieties	" 28	" 20	" 16	All did well.
Larkspur, 4 varieties	" 28	" 24	" 5	"
Mignonette	" 28	" 10	" 5	Did well.
Nasturtium, 3 varieties	" 28	July 6	" 5	"
Nicotiana, 2 varieties	June 2	" 1	" 5	"
Portulaca, double	May 28	June 26	" 5	"
Petunia, 5 varieties	" 26	" 24	" 16	Fine blooms.
Lobelia, Crystal Palace	" 27	" 15	" 5	Good border flower.
Phlox, 4 varieties	" 28	" 15	" 16	Splendid show of colours.
Pansies, 8 varieties	" 26	" 10	Nov. 6	Good show till November.
Poppies, 9 varieties	June 4	" 10	Sept. 5	Fine show.
Salpiglossis, 2 varieties	May 28	" 26	" 5	Extra fine.
Scabiosa, 3 varieties	" 28	July 15	" 5	Very good show.
Stocks, 3 varieties	" 26	June 16	" 16	" "
Tagetes signata pumila	" 28	" 8	" 5	Good border flower.
Verbena, 2 varieties	" 26	" 24	" 5	Very fine blooms.
Zinnia, 3 varieties	" 26	" 8	" 5	Did well.

ANNUALS.—Sown in the open.

The following annuals were sown in the open on May 9, except Sweet Pease, which were sown April 16, and May 10. All varieties bloomed freely, but were from two to four weeks later than the same varieties sown in the hot-house and transplanted.

Abronia umbellata.
Asters.
Ageratum.
Antirrhinum.
Calendula.
Coreopsis.
Centaurea.
Candytuft.
Chrysanthemum.
Clarkia.
Dianthus.
Eschscholtzia.
Gaillardia.
Godetia.
Mignonette.
Nasturtium.
Phlox Drummondii.
Poppies.
Salpiglossis.
Stocks.
Scabiosa.
Sweet Pease, 33 varieties.
Verbena.
Zinnia.

PERENNIALS.

The old beds of perennial flowers wintered well and flowered freely during the summer.

BULBS.

Dahlias.—Set out May 26. In flower July 29. Late on account of being injured by frost in June.

Gladioli.—Set out May 26. In flower August 10. Only a few bloomed.

Tulips.—Bloomed May 12. Were short, but fine blooms.

Cannas.—Bulbs rotted.

Iris.—Planted 1900. Bloomed freely from June 7 to end of July.

PÆONIES.

Planted in 1900. Flowered well, but were a good deal beaten down by heavy rains as buds were opening.

Following will be found a list of the perennial flowers that were living at the end of the past season. The majority of these were sent up from the Central Experimental Farm in 1900, and have proved sufficiently hardy for this climate.

IRIS.

Amœna Crebillon.
" Julia Grisie.
" Maria Theresa.
" Mrs. H. Darwin.
Balkana.
Blondovi.
Chamæriris.
Ensata.
" Biglumis.
" Oxypetala.
Flavescens.
Furcata.
Germanica.
Germanica Verschuur.
Gigantea.
Hungarica.
Neglecta Arlequin Milanais.
" Hericartiana.
Nudicaulis.
Orientalis.
Plicata Gisela.
Prismatica.
Pumila.
" Gracilis.
" Lutea.
Regina.

IRIS—*Concluded.*

Ruthenica.
Sibirica.
" Constantinopolitana.
" Furcata.
" Hæmatophylla.
" Light Blue.
" Lutea.
" Maritima.
" Tenuifolia.
Squalens.
" Bronze Stoffel.
" Hector.
" Lady Seymour.
Squalens La Marmora.
" La Tristesse.
" Minerva.
" Tarquin.
Variegata.
" Arquinto.
" Henry Havard.
" Honorabile.
" pancrace.
" Minos.
" Samson.
Virescens.

PÆONIES.

Pæonia Sinensis—
Souvenir de l'Exposition.
Albiflora Thorbecki.
Festiva.
Prosper d'Aremburg.
Thorbecki.
Officinalis Mutabilis.
De Candolle.
Festiva Maxima.
Rubra plenissima.
Rubicunda Alba Marg.
Duchesse d'Orleans.
Ambroise Verschaffelt.
L'Eclatante.
Tenuifolia fl. pl.

SUNDRY PERENNIALS.

Ajuga genevensis.
Acorus spurius.
Achillea millefolium rubrum.
" ptarmica fl. pl.
Aster Novæ Angliæ roseus.
" Top Sawyer.
Aconitum napellus.
Artemisia stellarianum.
Boltonia latisquama.
Campanula macrantha.
Centaurea macrocephala.
" montana alba.
Clematis recta.
Dictamnus fraxinella.
Delphinium.
Dahlia.
Erigeron macranthus.
Funkia lancifolia.
Grass Pink.
Gladiolus.
Hyacinthus candicans.
Helianthus Maximiliana.
Hemerocallis Kwanso fl. pl.
" Middendorfii.
" fulva.
" disticha fl. pl.
" graminæfolia.
Hemerocallis Dumortieri.
Lupinus.
" Pres. Cleveland.
" polyphyllus.
Lychnis Hybrid.
Lysimachia nummularifolia.
Phalaris arundinacea, fol. var.
Pyrethrum uliginosum.
Rose, Queen of the Prairie.
" Persian Yellow.
" Sweet Briar.
Rosa rugosa alba.
Double Rose.
Rosa Cinnamonea.
" Rugosa.
" Baronne Prevost.
Hyb. P. Rose Clara Cochet.
Rosa Acicularis.
" Lucida.
" Nutkana.
" macrantha.
Rudbeckia Golden glow.
" Laciniata.
Solidago rigida.
" gigantea.
Spiraea Ulmaria.
" filipendula.

SUNDRY PERENNIALS—*Concluded.*

Sidalcea candida.	Veronica spicata.
Symphytum asperrimum.	" salurgoides.
Thermopsis fabacea.	" Virginica.
Veronica elegans carnea.	Viola pedata.

TREES AND SHRUBS.

The trees and shrubs on this farm made rapid growth during the past season. The frequent rains in August and September extended the growing period longer than usual.

Very few seeds formed on the ash-leaved Maple trees, but Caragana, Honeysuckle and other shrubs seeded very heavily.

108,000 seedling maple and a large number of Cottonwood trees, Caragana and other shrubs were taken up this fall for next year's distribution.

The following trees and shrubs have done the best on the Indian Head Farm, and can be recommended for cultivation throughout the Territories:—

Botanical Name—	*Common Name—*
Acer Negundo.	Box Elder.
Acer Tataricum Ginnala.	Ginnalian Maple.
Alnus glutinosa.	Common Alder.
Betula populifolia.	White Birch.
Caragana arborescens.	Siberian Pea Tree.
Cornus stolonifera.	Red Osier Dogwood.
Cotoneaster integerrima.	Common Cotoneaster.
Crataegus chlorosarca.	
" coccinea.	Scarlet Haw.
" Crus galli.	Cockspur Thorn.
Fraxinus americana.	White Ash.
" pennsylvanica lanceolata	Green Ash.
Lonicera Alberti.	Albert Regel's Honeysuckle.
" tatarica.	Tartarian Honeysuckle.
Populus balsamifera.	Balsam Poplar.
" deltoidea.	Cottonwood.
Rhamnus cathartica.	Common Buckthorn.
Rhamnus frangula.	Breaking Buckthorn.
Ribes aureum.	Missouri Currant.
" Sibirica.	Siberian Currant.
Salix pentandra.	Laurel-leaved Willow.
" purpurea pendula.	Pendulous Purple Willow.
" Voronesh.	Voronesh Willow.
Syringa chinensis.	Rouen Lilac.
" Josikea.	Josika's Lilac.
" vulgaris.	Common Lilac.
Ulmus americanus.	American Elm.
Viburnum Opulus.	Highbush Cranberry.

ARBORETUM.

The Arboretum was very attractive during the past season, and proved of interest to visitors at all times from the early spring till late in the fall. On account of the abundant rains, everything made extra strong growth.

(Photo. by C. E. Saunders.)

Crop of Red Fife in Stook at Indian Head.

A list is appended of the species and varieties under observation at present, giving the date planted and particulars as to hardiness. Those which have come through one or more winters without injury, or with very slight injury to the tips only, are marked hardy; where the new wood has been killed back to one-half its growth, the variety has been marked half hardy; and those which have had their wood killed to the ground by winter, have been noted as tender.

No additions were made to the Arboretum last spring.

Botanical Name.	Common Name.	Planted.	Remarks.
Acanthopanax sessiliflorum		1900	Nearly hardy.
Acer dasycarpum	White maple	1896	Half hardy.
" Negundo	Box elder	1895	Hardy.
" platanoides	Norway maple	1896	Half hardy.
" saccharinum	Rock or sugar maple	1899	"
" " Minn. seed No. 1		1897	"
" tataricum	Tartarian maple	1902	Hardy.
" " ginnala	Ginnalian maple	1895	"
Alnus glutinosa	Common alder	1896	"
" " imperialis	Imperial cut-leaved alder	1899	Tender.
" viridis	Green alder	1896	"
Amelanchier alnifolia	Alder-leaved June-berry	1902	Hardy.
Amorpha canescens	Lead plant	1900	Half hardy.
" fruticosa		1902	Tender.
Artemisia abrotanum	Old man	1895	Half hardy.
" " tobolskianum	Siberian Southernwood	1895	"
Berberis amurensis	Amur barberry	1899	Hardy.
" aristata		1896	Half hardy.
" asiatica		1902	"
" canadensis		1902	"
" cerasina		1896	Hardy.
" cretica	Cretan barberry	1899	Nearly hardy.
" Fischeri		1896	Half hardy.
" hybrid No. 2		1899	Hardy.
" ilicifolia	Holly-leaved barberry	1896	Half hardy.
" Sieboldii	Siebold's "	1898	"
" sinensis	Chinese "	1896	"
" Thunbergii	Thunberg's "	1897	"
" vulgaris iberica		1899	Nearly hardy.
" " japonica		1899	Half hardy.
" " foliis purpureis		1896	Tender.
" " violacea		1897	Nearly hardy.
Betula alba	European white birch	1895	Hardy.
" " fastigiata		1899	Tender.
" " laciniata pendula	Cut-leaved birch	1899	Hardy.
" " pendula Youngii	Young's weeping birch	1900	Half hardy.
" " purpurea		1902	"
" davurica		1896	Hardy.
" (from Niemetz)		1898	Half hardy.
" lenta	Sweet birch	1899	Nearly hardy.
" lutea	Yellow birch	1899	Half hardy.
" papyrifera	Paper birch	1896	Nearly hardy.
" populifolia	White birch	1899	Half hardy.
" pumila	Low birch	1899	Hardy.
Caragana arborescens	Siberian Pea-tree	1895	"
" Chamlagu		1900	"
" frutescens	Woody caragana	1895	"
" " mollis glabra		1896	"
" grandiflora	Large-flowered caragana	1896	"
" microphylla		1901	"
" pygmaea	Dwarf caragana	1896	"
" " aurantiaca		1900	"
" Redowskii		1895	"
Celastrus scandens	Climbing bitter-sweet	1898	Half hardy.
Celtis occidentalis	Hackberry	1901	"
Clematis Flammula	Sweet-scented Virgin's bower	1898	"
" ligusticifolia		1898	Hardy.
" recta		1898	Half hardy.
" Viticella		1901	"

Botanical Name.	Common Name.	Planted.	Remarks.
Cornus alba sibirica	Siberian dogwood	1897	Hardy.
" " " variegata	Variegated "	1897	Nearly hardy.
" " " Spaethi	Spath's "	1899	Tender.
" Baileyi		1899	Hardy.
" sanguinea		1897	"
" stolonifera		1896	"
Cotoneaster acutifolia		1899	"
" integerrima	Common Cotoneaster	1896	"
" laxiflora		1899	"
" No. 10 Niemetz		1898	"
Crataegus chlorosarca		1896	"
" coccinea	Scarlet haw	1896	"
" Crus-galli	Cockspur thorn	1896	"
" Douglasii		1902	Tender.
" nigra		1900	"
" No. 9 Niemetz		1898	"
" oxyacantha Sibirica		1897	"
" sanguinea		1897	"
Cytisus biflorus		1899	"
" capitatus		1899	Hardy.
" nigricans		1899	Half hardy.
" " longispicatus		1898	Tender.
" purpureus		1902	"
" sessilifolius		1896	Half hardy.
" triflorus		1902	Tender.
Diervilla lutea		1902	Half hardy.
Elaeagnus angustifolia	Russian olive	1895	Nearly hardy.
" argentea	Wolf willow	1895	Hardy.
" macrophylla		1895	"
Euonymus atropurpureus	Burning bush	1896	Half hardy.
" europaeus	Common spindle-tree	1896	"
" linearis		1902	Hardy.
Fraxinus americana	White ash	1896	Nearly hardy.
" berlandieriana	Berlandier ash	1897	Tender.
" nigra	Black ash	1899	Hardy.
" pennsylvanica	Red ash	1895	"
" quadrangulata	Blue ash	1897	Tender.
Genista tinctoria sibirica		1899	"
Hydrangea paniculata		1896	Tender.
" hortensis		1899	"
Juglans cinerea	Butternut	1898	"
Laburnum alpinum		1898	"
Ligustrum amurensis	Amur privet	1899	Half hardy.
" vulg. fol. aureis var		1899	Tender.
Lonicera Alberti	Albert Regel's honeysuckle	1896	Hardy.
" bella atrorosea		1902	"
" flava		1899	"
" gracilipes		1899	"
" hirsuta	Hairy honeysuckle	1899	"
" Morrowi		1902	"
" notha carnea		1902	Tender.
" " gilva		1902	Hardy.
" punicea		1899	Tender.
" regeliana		1901	"
" ruprechtiana		1901	Hardy.
" Sullivantii		1901	Tender.
" tatarica	Tartarian honeysuckle	1896	Hardy.
" " alba rosea		1902	"
" " elegans		1899	"
" " grandiflora rubra		1899	"
" " splendens		1902	"
" Xylosteum		1899	Half hardy.
Lycium europeum		1902	Tender.
" chinense		1902	Half hardy.
Neillia opulifolia	Ninebark	1900	Nearly hardy.
Ostrya virginica	Ironwood	1899	Hardy.
Philadelphus deutziæflorus		1896	Half hardy.
" grandiflorus		1896	"
" hyb. Lem. Boule d'Argent		1899	Tender.
" Keteleerii flore pleno		1900	"
Photinia variabilis arguta		1899	"

Botanical name.	Common name.	Planted.	Remarks.
Populus alba nivea		1896	Hardy.
" " " pyramidalis	Pyramidal Silver poplar	1896	Nearly hardy.
" balsamifera	Balsam poplar	1895	Hardy.
" berolinensis		1895	"
" certinensis		1896	"
" deltoidea	Cottonwood	1895	"
" nigra	Black poplar	1898	"
" " Nolestii		1896	"
" petrowskyana		1896	"
" sibirica		1895	"
" suaveolens		1898	"
" tremuloides	White poplar	1895	"
" Wobstii		1896	"
Potentilla fruticosa	Shrubby Cinque-foil	1899	"
Prunus Besseyi		1902	Half hardy.
" demissa	Western wild cherry	1895	Hardy.
" grayana, Maxim		1896	"
" Maackii		1896	"
" Maximowiczii		1899	"
" pennsylvanica		1895	"
" pumila	Sand cherry	1895	"
" " (Seedling of Wonder)		1901	Half hardy.
" serotina	Wild black cherry	1899	"
" tomentosa		1902	Tender.
" utahensis		1902	Hardy.
Pyrus americana	American mountain ash	1896	"
" aria flabelliformis		1897	"
" aucuparia	European mountain ash	1896	Half hardy.
" baccata	Siberian crab apple	1896	Hardy.
" betulæfolia		1902	Half hardy.
" Maulei	Maule's Japanese quince	1899	"
" nigra salicifolia		1900	Tender.
" rotundifolia		1900	"
" spuria		1896	Hardy.
" sinensis		1902	Tender.
Quercus coccinea	Scarlet oak	1899	Half hardy.
" (Japanese)		1899	"
" macrocarpa	Mossy-cup oak	1895	Hardy.
" pedunculata fastigiata		1902	Tender.
Rhamnus cathartica	Common buckthorn	1896	Hardy.
" crenata		1900	Tender.
" davurica		1899	Hardy.
" Frangula	Breaking buckthorn	1896	Nearly hardy.
" No. 13 Niemetz		1898	Hardy.
Rhus glabra	Smooth sumach	1896	Nearly hardy.
Ribes alpinum	Mountain currant	1899	Tender.
" " pumilum		1899	Hardy.
" aureum	Missouri currant	1899	"
" " tenuiflorum		1901	Nearly hardy.
" (Cypress Hills)		1900	Hardy.
" robustum		1899	Tender.
" saxatile		1899	Hardy.
" sibirica		1898	"
Rosa blanda	Smooth rose	1898	"
" californica		1899	Half hardy.
" cinnamomea		1902	Hardy.
" ferruginea	Purple-leaved rose	1895	Half hardy.
" rubiginosa		1899	"
" rugosa	Japanese rose	1896	Hardy.
" lucida grandiflora		1902	"
" villosa pomifera		1898	Nearly hardy.
Rubus balfourianus		1900	Hardy.
" caesius		1900	"
Salix alba argentea	Silver-leaved willow	1897	Half hardy.
" " britzensis		1896	Hardy.
Salix aurea pendula		1896	Nearly hardy.
" Bataviae		1898	"
" Caprea	Goat willow	1897	Half hardy.
" daphnoides	Violet willow	1895	Hardy.
" longifolia argyrophylla		1898	Half hardy.

Botanical name.	Common name.	Planted.	Remarks.
Salix Nicholsoni purpurascens		1898	Nearly hardy.
" nigricans	Dark broad-leaved willow	1898	"
" pentandra	Laurel-leaved willow	1896	Hardy.
" purpurea pendula		1896	"
" rubra forbyana		1896	Half hardy.
" Salamoni		1898	"
" triandra		1897	"
" Voronesh		1895	Hardy.
Sambucus (Blue-fruited from B.C.)		1899	Tender.
" canadensis	Common elder	1896	Nearly hardy.
" nigra		1902	Tender.
" " aurea nova		1896	"
" " foliis aureis		1896	"
" " heterophylla		1896	"
" " Swindonensis		1899	"
" " virescens		1899	"
" No. 45 Niemetz		1898	"
Shepherdia argentea	Buffalo berry	1895	Hardy.
Spiraea arguta		1896	"
" chamaedrifolia		1896	"
" discolor	White-beam leaved spiraea	1899	Half hardy.
" japonica	Japanese spiraea	1899	Tender.
" " alba		1899	Half hardy.
" " bumalda		1899	Tender.
" " superba		1896	"
" media		1899	"
" salicifolia	Common Meadow-sweet	1899	Hardy.
" sorbifolia	Sorbus-leaved spiraea	1898	Nearly hardy.
" tomentosa	Hard-hack	1898	Tender.
" Van Houttei	Van Houtte's spiraea	1895	Half hardy.
Symphoricarpus Heyeri		1900	Hardy.
" racemosus	Snow-berry	1895	"
Syringa chinensis	Rouen lilac	1896	"
" Emodi		1901	"
" Josikea	Josika's lilac	1895	Half hardy.
" pekinensis	Pekin lilac	1899	"
" villosa		1895	Hardy.
" vulgaris	Common lilac	1895	"
" " Abel Carriere		1901	"
" " alba	White lilac	1899	"
" " alba grandiflora		1899	"
" " Alphonse Lavallée		1901	"
" " Charles Joly		1901	"
" " Charles X		1899	"
" " Condorcet		1901	"
" " Congo		1901	"
" " de Marley		1901	"
" " Emilie Lemoine		1901	"
" " Francisque Morel		1901	"
" " La Tour d'Auvergne		1901	"
" " Lemoinei		1901	"
" " Mad. Casimir Perier		1901	"
" " Madame Lemoine		1901	"
" " Marie Legraye		1901	"
" " Mathieu de Dombasle		1901	"
" " Maxime Cornu		1901	"
" " Michel Buchner		1901	"
" " President Grevy		1901	"
" " purpurea		1901	Half hardy.
" " rubella		1901	Hardy.
" " Virginité		1901	"
Tilia americana	Basswood	1896	"
Ulmus americanus	American elm	1895	"
Viburnum Lantana	Wayfaring tree	1898	Half hardy.
" molle		1902	Tender.
" Opulus	High-bush Cranberry	1895	Hardy.
" " sterile		1898	Half hardy.
" prunifolium	Nanny-berry	1899	Hardy.

Botanical name.	Common name.	Planted.	Remarks.
Coniferae.			
Abies balsamea	Balsam fir	1896	Hardy.
" " variegata	Variegated fir	1900	Tender.
" lasiocarpa		1898	Half hardy.
Juniperus Sabina	Common Savin	1901	Hardy.
" " variegata	Variegated Savin	1901	"
" Virginiana elegans variegata		1899	"
" " Schotti		1899	"
" " tripartita		1899	Tender.
Larix europea	European Larch	1899	Nearly hardy.
" pendula	Tamarack	1896	Hardy.
Picea alba	White Spruce	1895	"
" " coerulea		1901	Tender.
" " variegata		1899	Hardy.
" alcockiana	Alcock's spruce	1898	Tender.
" Engelmanni		1900	Hardy.
" excelsa	Norway spruce	1895	Nearly hardy.
" " pendula major		1899	Tender.
" " pyramidalis	Pyramidal Norway spruce	1899	Nearly hardy.
" obovata Schrenkiana		1899	Hardy.
" pungens	Rocky Mountain spruce	1895	"
" " glauca		1899	"
Pinus banksiana	Jack pine	1902	"
" Cembra	Stone pine	1895	"
" laricio nigricans	Austrian pine	1899	Tender.
" montana	Mountain pine	1895	Nearly hardy.
" " Mughus	Dwarf mountain pine	1899	Half hardy.
" sylvestris	Scotch pine	1895	Hardy.
Pseudotsuga Douglasii	Douglas spruce	1895	Nearly hardy.
Thuya Occidentalis	White cedar	1895	Hardy.
" " Columbiae		1899	Nearly hardy.
" " Hoveii	Hovey's Arbor-vitae	1900	Half hardy.
" " Meehani	Meehan's Arbor-vitae	1900	Tender.
" " Variegata	Variegated cedar	1899	Hardy.
" " Wareana	Ware's Arbor-vitae	1899	Nearly hardy.

FRUIT TREES AND BUSHES.

The crop of fruit the past season was disappointing. Crab Apples (Pyrus baccata, &c.) and Raspberries alone gave good crops. Late spring frosts killed either the blossoms or the fruit of all other sorts. A few plums escaped, but were not ripe when frost came in September.

SEEDLING APPLES.

Two trees of Tonka (seedling) blossomed, and one produced fruit of a good size. The fruit on the second tree was small, but the tree died before they were fully matured, from rabbits eating the bark away last winter.

PLANTING.

The following seedlings of cross-bred apples were planted in 1902:—

42	seedlings of	Novelty.	20	seedlings of	Charles.
26	"	Progress.	6	"	Pioneer.
18	"	Prairie Gem.	2	"	Olive.
42	"	Aurora.	16	"	Eastman.
13	"	Belmont.	18	"	Eaton.
6	"	Cavan.	1	"	Dean.
1	"	Carleton.	6	"	Parker.

Last spring the following were planted in the same nursery:—

CROSS-BRED APPLES.

4 Northern Queen.
4 Derby.
4 Pioneer.
2 Progress.
4 Ruby.
4 Carleton.
4 Aurora.
4 Charles.

Seedlings from seed of Apples from Thos Frankland, Stonewall, Manitoba:—
1 seedling of Maud.
1 seedling Annie.

APPLE TREES.

3 Hibernal, grafted on Pyrus prunifolia.
3 Wealthy, grafted on Pyrus prunifolia.
2 North-western Greening, grafted on Pyrus baccata.
3 McMahon White, grafted on Pyrus baccata.
3 Yellow Transparent, grafted on Pyrus baccata.
3 Pointed Pipka, grafted on Pyrus prunifolia.
3 Duchess, grafted on Pyrus prunifolia.
3 Scott's Winter, grafted on Martha Crab seedling.
2 McIntosh Red, grafted on Martha Crab seedling.
2 Longfield, grafted on Martha Crab seedling.
3 Russian Seedling, No. 18, grafted on Pyrus prunifolia.
3 Russian Seedling, No. 22, grafted on Pyrus prunifolia.
2 Russian Seedling, No. 7, grafted on Pyrus prunifolia.
1 Russian Seedling, No. 26, grafted on Pyrus prunifolia.

PLUMS.

The following were planted last spring:—

2 Cheney,
1 Bixby.
2 Aitkin.
1 Mankato.

CURRANTS.

The following varieties were planted in 1902 in a new nursery, and are being tested:—

White.—White Cherry, Frauendorfer White, White Grape, Climax, White Kaiser, White Imperial, Large White, White Dutch, White Transparent.

Red.—Victoria, Manitoba Amber, London Red, Early Scarlet, Prince Albert, Wilder, Simcoe King, Large Red, North Star, Red Grape, La Condé, Fay's Prolific, Houghton Castle, Raby Castle, Rankin's Red, Versaillaise, Cherry, Fertile d'Angers.

Black.—Eclipse, Sterling, Black English, Gewonhliche, Stewart, Dominion, Success, Beauty, Clipper, Perry, Ethel, Winona, Star, Ontario, Crandall's Missouri, Ogden, Mattie, Black Grape, Merveille de la Gironde. Bang Up, Standard, Perth, Ismay's Prolific Black, Lewis.

GOOSEBERRIES.

In the same nursery as the currants, the following gooseberries were planted in 1902:—

3 Governess, 2 Smith's Improved, and in 1903—

2 Houghton.
1 Cox's Late Green.
1 Cluster.
2 Downing.
2 Lady Houghton.
1 Carman.

Also Saunders' Cross-breds.

2 Merton.	2 Richland.
4 Mabel.	1 Sussex.
2 Edna.	4 Pale Red.
1 Griffin.	6 Red Jacket.
1 York.	5 Rideau.
2 Sandow.	1 Ruth.
2 Weir.	2 Saunders.
1 Troy.	2 Gibb.

FRUIT CROP.

PYRUS BACCATA AND PRUNIFOLIA.

Many of these Pyrus trees were loaded with fruit, the best of which were ripe before frost came hard enough to injure them.

PLUMS.

The plum crop was a failure. Although some trees had considerable fruit, none of it ripened. The Aitkin plum, which is the earliest variety on the farm, had a little fruit, but it disappeared before it had a chance to mature.

The native varieties were no more fruitful than the improved sorts.

CHERRIES.

All the varieties were more or less killed back, and though blossoms appeared on one variety, no fruit formed.

SMALL FRUITS.

CURRANTS.

Red, White and Black Currants were killed by frost after they were well formed. The varieties set out in the spring of 1902 made good progress this year. The following varieties are under test :—

Black.—Pomona, Stewart, Clipper, Black Victoria, Black Naples, Native Black, Perry, Eagle, Monarch, Charmer, Beauty, Ontario, Stewart, Ethel, Sterling, Standard, Orton, Star, Madoc, Climax, Kerry Eclipse, Oxford, Winona, Lewis, Prince of Wales.

Red.—Fay's Prolific, Wilder, North Star, Raby Castle, Red Dutch, Cherry, Versaillaise, Fertile d'Angers, Prince Albert, Victoria.

White.—White Imperial, White Grape, White Dutch.

RASPBERRIES.

Dr. Reider, Turner, Caroline, Miller, Garfield, Lady Anne, Mary, Marlborough, Kenyon Seedling.

All varieties had a good crop of fruit.

GOOSEBERRIES.

Houghton, Pearl, Golden Prolific, Columbus, Keepsake, Smith's Improved, Lancashire Lad, Governess.

Blossoms were entirely killed by frost.

STRAWBERRIES.

Vines were dead when spring opened.

CATTLE.

The herd of cattle at present consists of 54 head; this includes 18 steers purchased for feeding tests.

The animals raised on the farm are 16 pure-bred Shorthorn cows and heifers, and 19 cross-bred cows, heifers and steers.

The bull 'Arbor,' bred by E. Potter, Lowfield, Kirby Lonsdale, England, imported by the Experimental Farm, Ottawa, and sent up last fall, is at the head of the herd.

The three bulls in use on the farm when my last report was sent in were sold during the fall and early spring.

In December last every animal in the herd was tested for tuberculosis, and I am pleased to report that not one that had been raised on the farm was affected. Fifteen steers had, shortly before that, been purchased for feeding tests. Four of these reacted and were killed. Three were badly affected, while in the fourth the disease was not found, but it had inflammation of the lungs.

The herd was never in better condition than at present.

FEEDING TEST.

Fifteen three-year-old steers were purchased last November for feeding tests. Out of these, four had to be killed, as already stated.

Ten steers out of the 11 left were chosen and divided into two lots of five each.

Both lots received the same ration during the entire time they were being fed, including the preparatory period and after the test was completed.

The test was for 16 weeks, and commenced on December 11.

Lot No. 1 was turned out each day for two hours.

Lot No. 2 was kept continuously in the stable.

The test was carried on to ascertain whether close confinement was a benefit or not in feeding animals.

The meal used consisted of 2 parts barley and 1 part small wheat.

The first month 6 lbs. per day was given to each animal, and increased each month by 2 lbs.

Hay was fed morning and night, and oat or barley straw at noon. Each animal received all the hay and straw it could eat.

Following will be found a statement of the monthly and total weights and gains of each lot during the period of the test; weights and gain made during the whole period from November 4 to May 2; the total amount and estimated value of the feed consumed during the same time; and a summary of the financial results of the transaction.

It will be observed that Lot No. 2, confined in the stable, made a very small total gain over the lot let out for exercise.

MONTHLY and total weights and gains of each lot of steers during the period of test:—

Lot.	Weight at start of test.	1st 4 weeks.		2nd 4 weeks.		3rd 4 weeks.		4th 4 weeks.		Total Gain.
		Weight.	Gain.	Weight.	Gain.	Weight.	Gain.	Weight.	Gain.	
	Lbs	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Lot No. 1.. ...	6,810	7,150	340	7,380	230	7,670	290	7,930	260	1,120
Lot No. 2......	6,700	7,070	370	7,280	210	7,510	230	7,720	210	1,020

Lot.	Weight when bought, November 4.	Weight when sold, May 2.	Gain.
	Lbs.	Lbs.	Lbs.
Lot No. 1	6,620	8,140	1,520
Lot No. 2, ...	6,465	8,080	1,615
	13,085	*16,220	3,135

*Sold less 5 per cent shrinkage, leaving net weight 15,409 lbs.

Total weight and estimated value of feed consumed during the whole period—November 4 to May 2 :—

Preparatory feeding, each lot (five steers), 36 days—

Straw, 3,600 lbs. at $1 per ton..	$ 1 80
Meal, 720 lbs. at $\frac{2}{3}$c. per lb.	4 80
	$ 6 60

Or for both lots, $13.20.

During test* (112 days), each lot—

Hay, 10,656 lbs. at $5 per ton..	$26 64
Meal, 5,040 lbs. at $\frac{2}{3}$c. per lb..	33 60
Ground linseed, 210 lbs. at 2c. per lb....................	4 20
	$64 44

Or for both lots, $128.88.

From end of test till sold (31 days), each lot—

Hay, 2,984 lbs. at $5 per ton..	$ 7 46
Meal, 1,860 lbs. at $\frac{1}{3}$c. per lb..	6 20
Ground linseed, 77½ lbs. at 2c. per lb..	1 55
	$15 21

Or for both lots, $30.42.

*Record was not kept of the weight of straw consumed during test.

Summary of cost of feeding—

Preparatory feeding..........	$ 13 20
During test..........	128 88
Till sold..........	30 42
	$172 50

Or for each steer, $17.25.

Or for each lot of five steers, $86.25.

SUMMARY of the Financial result of the Transaction.

Lot.	Weight bought.	At	Amount paid.	Add Cost of Feed.	Total Cost.	Weight sold.	At	Amount received.	Gain on each lot.	Gain per head.
	Lbs.	Cts.	$ cts.	$ cts.	$ cts.	Lbs.	Cts.	$ cts.	$ cts.	$ cts.
No. 1......	6,620	3½	231 70	86 25	317 95	7,733	4¼	328 65	10 70	2 14
No. 2......	6,465	3½	226 27	86 25	312 52	7,676	4¼	326 23	13 71	2 74
Total...	13,085	3½	457 97	172 50	630 47	15,409	4¼	654 88	24 41	*

* An average net gain of $2.44 per head.

On account of the price of steers being high when purchased and the export value of cattle having fallen considerably by the time the animals could be sold, the amount realized was very little above their cost and the value of feed consumed.

HORSES.

There are at present 13 horses on the farm. In the spring two young, light horses were exchanged for heavier ones; otherwise the working force remains the same as last year. The health of the horses has been good.

SWINE.

Three breeds, Berkshire, Tamworth and Improved Yorkshire White are kept on the farm at present. Since the last report nine Berkshire boars and five sows, and six Tamworth boars and three sows have been sold to farmers for breeding purposes.

POULTRY.

Three breeds are kept on the farm at present, namely: Black Minorcas, Light Brahmas and Plymouth Rocks. All breeds did well. During the 12 weeks from April 3 to June 20, the eggs laid were kept separate and the number laid by each breed recorded, with the following result:—

Black Minorca.—Sixteen hens laid 496 eggs, an average of 31 each hen.

Plymouth Rock.—Eleven hens laid 275 eggs, an average of 25 for each hen.

Light Brahma.—Twelve hens laid 372 eggs, an average of 31 for each hen.

After June 20, the eggs were not kept separate.

EXHIBITS FOR ST. LOUIS EXHIBITION.

During the past year a large number of exhibits have been prepared and forwarded to Ottawa for the St. Louis Exposition to be held in 1904.

Sixteen large cases of grain and grasses from the crop of 1902 were shipped early in November, and the same number of cases of this year's grain at the end of that month. In addition three cases of fruits and vegetables in bottles, and threshed grain in bags accompanied these shipments.

Fifteen agricultural societies were requested to collect samples from this year's crop from their respective districts. Although all expenses were guaranteed, only one society, Edmonton, sent in anything whatever. A few sheaves were collected by a private party at Moosomin, and I regret that out of the whole of the Territories so little interest has been taken in the matter.

When harvest commenced in 1902, a member of the staff visited the leading grain districts in Assiniboia, Saskatchewan and Alberta, and made arrangements for samples to be sent to the Experimental Farm from the crop then being harvested. I am sorry to say that Pincher Creek alone did anything in the matter.

Samples were collected in the Indian Head district last year of sheaves, and this year of threshed grain by one of the Experimental Farm staff. These have been prepared and sent forward to Ottawa.

GASOLINE ENGINE.

A gasoline engine was obtained after harvest from Goold, Shapley & Muir, Brantford, Ont., and I am pleased to say gave good satisfaction. The engine 'Ideal' is 18-horse power, and ran a 28-inch 'Advance' separator with apparent ease. Some trouble took place at first through want of knowledge in operating the engine, but this was only temporary.

DISTRIBUTION OF SAMPLES.

During the months of March, April and May, the following distribution of samples of products of the farm was made to applicants throughout the Territories of Assiniboia, Alberta and Saskatchewan.

GRAIN.

Wheat	278	bags, 3 lbs. each.
Oats	411	"
Barley	196	"
Pease	232	"
Sundries	41	"
Potatoes	497	"
Tree seeds.—Maple	675	" 1 lb. each.
Grass seed.—Brome	167	"
Western Rye	15	"
Small seeds	326	packages containing 6,155 packets shrub seed, flower seeds, root seeds, garden seeds and corn.
Fruit bushes	163	packages.
Tree and shrub seedlings	452	"

CORRESPONDENCE.

During the twelve months ending October 31, 1903, 4,926 letters were received, and 4,980 mailed from this office. In letters received, circular reports on grain and other samples are not counted, and in letters mailed, circulars of instruction sent with grain and other samples are not included.

METEOROLOGICAL.

Month.	Temperature. Maximum.		Temperature. Minimum.		Snow-fall.	Rain-fall.		Hours of Bright Sunshine.
	Date.	Degrees	Date.	Degrees	Inches.	No. of days.	Inches.	
1902.								
November	2	50	10	—10	6	....	....	48·4
December	17	32	25	—34	13	....	....	43·2
1903.								
January	25	37	12	—31	4	....	....	66·1
February	26	34	15	—42	1	....	....	124·2
March	31	55	19	—25	3½	1	·07	152·3
April	26	75	29	4	1	2	·06	164·3
May	14	92	5	21	....	14	4·08	200·1
June	17	84	10	30	....	8	1·29	228·1
July	23	86	31	35	....	11	4·23	249·4
August	20	83	9	40	....	13	4·16	164·7
September	28	76	27	24	....	10	1·26	121·2
October	13	75	17	11	....	6	·40	172·6
					28½	65	15·55	1,734·6

I have the honour to be, sir,

Your obedient servant,

ANGUS MACKAY,

Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

Dr. Wm. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to present my report of the progress made and the work done on the Experimental Farm at Agassiz, B.C., for the year 1903. The season was unfavourable in many respects from the early spring until after the crops were secured. The winter was mild and the lowest temperature was 18 above zero on March 11, and there were no very severe wind storms. There was a heavy fall of snow in March, which clung to the branches of the trees as it fell, and many fruit trees were injured, large limbs being split off by the weight of snow. The spring was cold, with frequent showers and with north winds, and the soil remained cold until late in the season, retarding growth in the trees and shrubs, and causing many seeds to fail to germinate, and much of the bloom of the fruit trees to fall off. The weather continued cool throughout, there being only a few days of warm weather during summer. The whole season, and especially during harvest, was cool and showery, which delayed the harvesting and made it more expensive than usual, besides the loss from damaged grain and the shelling of oats and pease in the turnings made necessary by the frequent heavy showers. The crops of grain, roots and hay have been fairly good and prices satisfactory. The fall weather has been mild, with only one fall of snow, and the lowest range of the thermometer up to the present being 22 above zero, enabling farmers to get all roots harvested and other fall work done without delay or injury from frost.

FRUIT CROP.

The fruit crop has been only a very moderate one, but apples have been freer from scab than usual.

HEDGES.

The hedges have made a good growth. There are forty-five of them, and that number gives a fairly wide choice to those desiring to plant an ornamental hedge.

ORNAMENTAL TREES AND SHRUBS.

The shrubs and trees have made a fine growth, especially during the flowering season, were very handsome, and many inquiries are received as to where they can be had the best advantage.

FOREST AND TIMBER PLANTATIONS.

The forest trees planted in the shelter belt continue to grow vigorously, and a considerable number of the timber and nut trees planted on the mountain are making a fair growth, but as these trees have received no care since planting a great growth is not to be expected, at least until they get up above the hazel and other undergrowth.

NUT TREES.

The English and American black walnut trees produced a small crop of nuts, and Japanese and heart-shaped walnut trees a fair crop this season. The chestnut trees bloom late in the spring every year, but this year they were so very late that the nuts did not fill. The walnuts of all sorts are being distributed to farmers throughout the province, as in past years, and many of those who received nuts in previous years report good success in raising trees. The pecan trees are growing into strong trees, but are not large enough yet to bear nuts. All of the filbert bushes have grown splendidly, but as in former years, the crop was light, and the bluejays carry off much of the fruit before it is ripe.

DITCHING.

Owing to the scarcity of labour and the pressure of other work, very little ditching has been done this year.

NEW BREAKING.

Nearly fifteen acres have been ploughed and cropped for the first time this year, and a small area cleared and partly grubbed, and this work will be continued during the winter as the weather and conditions of the ground permits.

LIVE STOCK.

The stock bull mentioned in my last report injured one of his hind legs, and although kept in for some months, never recovered, and was finally slaughtered. Three of the four bull calves then mentioned have been sold at satisfactory prices, and the fourth is still on the farm. A young bull has been received from the Central Experimental Farm, and, as he is from imported stock noted for their superior milking qualities and is a nice, well-formed calf, he is likely to be a valuable acquisition to our stock. The present herd consists of seven registered Shorthorn cows, three heifers, two young bulls, two young bull calves and four heifer calves.

SHEEP.

The flock at present consists of twelve ewes and ewe lambs and two rams, seven head having been sold since my last report. The Dorset Horned breed appears to be well adapted to the damp climate of the coast, and also to make a satisfactory cross with the common sheep.

PIGS.

The stock at present consists of one white Yorkshire boar and two young sows, two Berkshire boars, two sows and four small cross-bred pigs. The Yorkshire pigs and two of the Berkshires were recently received from the Central Experimental Farm, and are very fine animals.

HORSES.

The force of horses consists of five of the original purchase made in 1889, and the two young horses bought one year ago. These latter have proved to be very useful horses, and have given good satisfaction. Another team will be necessary for next season's work, owing to the increasing area under cultivation and the age of the old horses.

BEES.

This has been a poor season for bees, not enough honey having been secured by any one swarm to carry it over. All are being given a little feed now, and we hope thus to carry seven swarms through the winter

FOWLS.

There are on this farm five breeds of fowls—Light Brahmas, Barred Plymouth Rocks, Black Minorcas, Buff Orpingtons and Rhode Island Reds. The two latter are this year's birds—hatched last spring—so have not been tested, except as to weight of cockerels and general thrift.

Of the three first breeds the Black Minorcas are the best layers, and lay large white eggs, but the Barred Plymouth Rocks come very nearly up to them as layers, and far surpass them as table fowls. The Light Brahmas are good layers, but do not come up in this respect to the Black Minorcas or B. P. Rocks. The feathers on their feet and legs are a disadvantage in this climate, as they keep them damp and cold. They are a very fair table fowl, but do not mature quite so early as is desired.

Both the B. P. Rocks and Light Brahmas are good sitters and good mothers, and are profitable up to the age of two and a half years, when they are apt to get too fat and lay few eggs.

The Buff Orpingtons grow large and rapidly, but with us do not mature as early as the B. P. Rocks and the Rhode Island Reds. The latter is a fine blocky bird, and matures early.

The hens are kept in breeding pens with yards attached, from January 1 to July 1; during the rest of the year they are allowed to run at large. They are not troubled by any disease, except sometimes a little rheumatism, caused by the wet weather, but crows and hawks carry off the chickens, even after they are well grown.

We have had an average of 60 per cent of chickens from eggs hatched in the incubator. These chickens were reared in a brooder and have been strong and healthy and have always done well, but have not been any stronger than those hatched and reared by hens.

The weight of cockerels per pair, live weight, at three months old, were respectively: B. P. Rocks, 8 lbs. 2 ozs.; Light Brahmas, 7 lbs. 8 ozs.; Buff Orpingtons, 7 lbs. 5 os.; Rhode Island Reds, 7 lbs. 10 ozs.; Black Minorcas, 6 lbs.

The hens are fed on mixed grain, $\frac{3}{4}$ wheat, $\frac{1}{8}$ oats and $\frac{1}{8}$ peas; sunflower seeds in the autumn, and boiled roots with some chop (whatever is on hand) mixed in, during the coldest weather in winter.

The hen-house is whitewashed several times a year and otherwise kept clean.

The treatment given to the farm fowls is in every way just what every farmer should and can give his hens.

EXPERIMENTS WITH OATS.

Fifty-four varieties of oats were tested this year. The land had been in corn the year previous, was fall ploughed and dressed with stable manure during the winter, and this was well worked in with the spade harrow and drag. The crop was very promising and the yield would have been heavy but a considerable portion was shelled during the process of curing owing to the frequent showers.

All were sown April 17, at the rate of two and a half bushels per acre. The soil was a sandy loam and the size of the plots one-fortieth of an acre each. There was scarcely any smut, but the rust was very bad, and materially lowered the yield, and by causing weakness in the straw and consequent falling down of the crop increased the cost of harvesting.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Bush.	Lbs.	Lbs.	
1	Holland	Aug. 18	123	46	Stiff	10	Sided	83	8	34¼	None.
2	Bavarian	" 13	118	42	Medium	10	Branching	82	32	34¾	"
3	Danish Island	" 19	124	48	Stiff	10	"	82	22	35	"
4	Milford (white)	" 12	117	44	Weak	9	Sided	82	12	34½	Slightly.
5	Sensation	" 11	116	42	Stiff	9	Branching	82	..	34½	"
6	Columbus	" 12	117	44	Weak	9	"	78	28	34	Consid'ably.
7	Tartar King	" 10	115	44	Stiff	9	Sided	77	28	35	None.
8	Abundance	" 17	122	42	Medium	9	Branching	75	30	34	Consid'ably.
9	Olive (white)	" 12	117	46	"	9	Sided	74	4	34¾	Slightly.
10	White Giant	" 17	122	46	Stiff	9	Branching	73	28	34	Consid'ably.
11	Cromwell	" 17	122	44	"	9	"	73	18	34	Slightly.
12	Kendal (white)	" 13	118	44	Medium	8	Half sided	73	8	34	"
13	Waverley	" 11	116	44	Stiff	10	Branching	72	12	34¾	"
14	Irish Victor	" 14	119	40	"	10	Sided	72	2	34½	"
15	Golden Tartarian	" 17	122	44	"	12	"	71	26	34	Badly.
16	Golden Fleece	" 14	119	46	Medium	9	Branching	71	6	34	Slightly.
17	Early Gothland	" 14	119	46	Stiff	9	"	69	14	34½	"
18	Siberian	" 13	118	42	"	10	"	69	4	34	Badly.
19	Improved Ligowo	" 11	116	48	"	10	"	68	28	34½	"
20	American Triumph	" 13	118	46	"	9	"	68	18	34	Consid'ably.
21	Probstey	" 11	116	46	"	10	"	67	8	34	Slightly.
22	Pense (white)	" 13	118	48	"	9	"	66	16	34¼	Consid'ably.
23	Hazlett's Seizure	" 14	119	48	"	10	"	66	6	34	Slightly.
24	Early Blossom	" 12	117	46	"	9	Sided	65	30	34	Badly.
25	Goldfinder	" 15	120	44	"	10	Branching	64	24	34	"
26	Pioneer	" 10	115	44	Medium	9	"	64	14	34½	Slightly.
27	Banner	" 13	118	46	Stiff	11	"	64	4	35	"
28	Olive (black)	" 14	119	44	Medium	8	Sided	63	28	34	Badly.
29	Kendal (black)	" 15	120	44	"	9	"	63	18	34	"
30	Joanette	" 11	115	42	"	10	Branching	63	8	34½	Consid'ably.
31	Abyssinia	" 17	122	46	Stiff	10	"	62	32	34	Slightly.
32	Wide Awake	" 15	120	42	Medium	9	"	62	22	34½	"
33	White Schonen	" 13	118	44	"	9	"	62	12	34¾	Consid'ably.
34	Early Golden Prolific	" 11	116	42	"	9	"	62	2	34	Slightly.
35	Lincoln	" 17	122	48	Stiff	10	"	61	26	34½	"
36	Golden Beauty	" 13	118	48	"	9	"	61	16	34	Consid'ably.
37	Pense (black)	" 19	124	46	"	9	"	61	16	34¾	Slightly.
38	Golden Giant	" 18	123	46	"	9	Sided	61	6	34	Consid'ably.
39	Mennonite	" 12	117	44	"	10	Branching	61	6	34	Badly.
40	Black Beauty	" 11	116	48	Weak	11	"	60	30	34	Slightly.
41	Holstein Prolific	" 15	120	42	Stiff	10	"	60	20	35	"
42	Salines	" 19	124	44	"	9	"	60	10	34½	Badly.
43	New Zealand	" 21	126	42	Medium	9	Sided	59	14	34	Slightly.
44	Swedish Select	" 11	116	48	Weak	9	Branching	59	4	34	"
45	Improved American	" 13	118	46	Stiff	9	"	58	28	34	Badly.
46	Buckbee's Illinois	" 19	124	46	"	9	"	58	28	34½	Slightly.
47	American Beauty	" 15	120	43	Medium	11	"	58	18	34	Badly.
48	Scotch Potato	" 15	120	42	Stiff	10	"	57	32	35	Slightly.
49	Longhoughton	" 17	122	40	Medium	9	"	57	22	34½	"
50	Wallis	" 17	122	46	Stiff	8	"	56	16	34	"
51	Twentieth Century	" 12	117	42	"	11	"	55	20	34	"
52	Milford (black)	" 14	119	39	Weak	8	"	55	10	34	Consid'ably.
53	Salzer's Big Four	" 15	120	38	Medium	9	"	54	10	34	Slightly.
54	Thousand Dollar	" 14	119	44	"	10	"	52	32	34	"

EXPERIMENTS WITH BARLEY.

Thirty-five varieties of barley were tested, fifteen of two-rowed and twenty of six-rowed. The soil chosen for these plots was a rather gravelly loam, with an open gravel bottom. It was fall ploughed and covered with a dressing of farm-yard manure during the winter, and this was well mixed with the soil and the seed sown.

(Photo. by C. E. Saunders.)

Road planting and Superintendent's residence at Agassiz.

The yield has been good, but the grain was much discoloured by the weather. All were sown on April 20, on plots of one-fortieth of an acre each, and all the barleys were free from rust and smut.

BARLEY, TWO-ROWED.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.
				Inches.		In.	Bush.	Lbs.	Lbs.
1	Dunham	Aug. 12..	114	42	Stiff & bright	3½	76	32	49
2	Beaver	" 15..	117	35	Medium	3½	75	..	49¼
3	Gordon	" 6..	108	46	Stiff	3	73	26	48½
4	Sidney	" 15..	117	44	Medium	3½	73	16	49
5	French Chevalier	" 15..	117	46	Stiff	4	70	40	49
6	Canadian Thorpe	" 12..	114	46	Stiff & bright	3	69	28	48½
7	Standwell	" 13..	115	44	" ..	3	67	4	48
8	Invincible	" 13..	115	42	" ..	3	66	12	48½
9	Harvey	" 10..	110	40	Stiff	3½	65	40	48
10	Danish Chevalier	" 13..	115	40	Medium	3	65	20	48
11	Newton	" 7..	109	44	Stiff & bright	3	62	44	48¼
12	Logan	" 10..	112	42	Stiff	4	61	12	48½
13	Clifford	" 7..	109	46	Stiff & bright	3½	59	28	48½
14	Fulton	" 14..	116	40	Medium	3	57	44	48
15	Jarvis	" 7..	109	46	Stiff	3½	56	32	48

BARLEY, SIX-ROWED.—TEST OF VARIETIES.

1	Mensury	Aug. 3..	105	42	Stiff	3	80	..	49
2	Mansfield	" 7..	109	40	Stiff & bright	2½	73	16	48½
3	Stella	" 12..	114	36	Weak	3	72	24	48
4	Brome	" 1..	103	42	Medium	2½	71	32	48½
5	Oderbruch	" 1..	103	40	Stiff	3	71	12	48
6	Royal	July 29..	100	42	"	3	68	36	48½
7	Empire	Aug. 7..	109	38	Stiff & bright	3	68	36	48½
8	Common	July 30..	101	40	Medium	3	67	4	49
9	Argyle	Aug. 6..	108	40	Stiff	3	65	40	48¾
10	Trooper	" 7..	109	36	Weak	3	65	20	48
11	Rennie's Improved	July 31..	102	40	Medium	3	65	20	48½
12	Nugent	Aug. 7..	109	44	Stiff & bright	3	65	20	48½
13	Baxter	" 1..	103	40	Medium	2½	64	28	48
14	Claude	" 3..	105	42	Stiff	3	62	4	48
15	Albert	" 7..	109	40	Medium	2½	61	32	48¼
16	Champion	July 28..	99	42	Stiff	3	61	32	48
17	Summit	Aug. 7..	109	42	Medium	3	60	20	48
18	Odessa	July 29..	100	43	"	3	58	16	48
19	Yale	Aug. 7..	109	40	Stiff & bright	2½	55	..	48
20	Garfield	" 7..	109	42	Medium	3	55	..	48

EXPERIMENTS WITH SPRING WHEAT.

Sixty varieties of spring wheat were tested this year, on plots of one-fortieth of an acre each. The soil was a fairly fertile sandy loam which had produced a heavy crop of corn and clover sod in 1902, and was fall ploughed in fall of 1902 and given a light top dressing of stable manure during the winter, and was well prepared for the seed before sowing. All the varieties were sown on April 15. The crop was handled so much after cutting, on account of the rain, that a good deal of it was shelled. The wheats were sown at the rate of one and a half bushels per acre, and they were not affected either by rust or smut.

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.
				In.		In.		Bush.	Lbs.	Lbs.
1	Percy	Aug. 10..	114	48	Stiff and bright.	3	Beardless.	46	40	60
2	Australian No. 19	" 10..	114	48	"	3	"	44	..	60
3	Advance	" 10..	114	44	"	3	Bearded..	42	40	60¾
4	Plumper	" 11..	115	40	"	3	"	42	..	61
5	Hastings	" 8..	112	40	Medium	3¼	Beardless.	41	40	60½
6	Bishop	" 11..	115	42	"	3	"	41	40	60
7	Monarch	" 17..	121	43	Stiff and bright.	3	"	41	20	61
8	Cartier	" 10..	114	44	Stiff	3	Bearded..	41	20	60
9	White Connell	" 17..	121	40	Stiff and bright.	2½	Beardless.	41	10	60½
10	Wellman's Fife	" 19..	123	48	Medium	3½	"	41	..	61½
11	Clyde	" 19..	123	40	"	3	"	41	..	60½
12	Alpha	" 14..	118	46	Stiff and bright.	3	"	40	50	61
13	Laurel	" 17..	121	44	"	3½	"	40	40	60¾
14	Australian No. 27	" 17..	121	43	"	3	"	40	30	61½
15	Preston	" 15..	119	44	Medium	3	"	40	20	61
16	Red Fern	" 17..	121	42	"	3½	Bearded..	40	20	60½
17	Fraser	" 10..	114	44	Stiff and bright.	3	"	40	10	61
18	Benton	" 19..	123	44	"	2½	Beardless.	40	10	60
19	White Russian	" 19..	123	46	"	4	"	40	..	61
20	Blair	" 20..	124	46	Medium	3	"	40	..	60
21	Roumanian	" 15..	119	46	"	3	Bearded..	39	50	60
22	Countess	" 11..	115	42	Stiff and bright.	4	Beardless.	39	40	61
23	Essex	" 16..	120	44	" "	4	"	39	30	61
24	Minnesota No. 163	" 18..	122	42	"	3½	"	39	20	61
25	Cassel	" 22..	126	42	Weak	2½	"	39	20	60
26	Goose	" 10..	114	46	Stiff and bright.	3½	Bearded..	39	10	60½
27	Crown	" 11..	115	46	"	3	"	39	..	61
28	Robin's Rust Proof	" 12..	116	40	Weak	3	Beardless.	39	..	60
29	Byron	" 10..	114	46	Medium	3	Bearded..	38	50	60½
30	Australian No. 25	" 12..	116	45	Stiff and bright.	3½	Beardless.	38	40	61
31	Huron	" 11..	115	42	"	3½	Bearded..	38	..	61
32	Stanley	" 14..	118	46	"	3½	Beardless.	37	50	60
33	Australian No. 10	" 18..	122	46	"	3	"	37	40	61
34	Crawford	" 8..	112	44	Medium	3	"	37	30	60
35	Red Swedish	" 10..	114	46	Stiff and bright.	3½	Bearded..	37	20	61½
36	Minnesota No. 181	" 21..	125	44	"	3½	Beardless.	37	..	60½
37	Minnesota No. 149	" 18..	122	41	"	3	"	36	50	61
38	Admiral	" 15..	119	46	"	3½	"	36	50	60
39	Early Riga	" 8.	112	40	Weak	2¾	"	36	40	60
40	White Fife	" 14..	118	46	Stiff and bright.	3	"	36	30	60½
41	Colorado	" 20..	124	44	"	3½	Bearded..	36	20	60½
42	Hungarian	" 12..	116	44	Medium	3½	"	36	..	61½
43	Red Fife	" 17..	121	46	"	3	Beardless.	36	..	60½
44	Australian No. 9	" 18..	122	46	Stiff and bright.	3	"	35	50	61
45	Pringle's Champlain	" 15..	119	40	"	3	"	35	40	60
46	Australian No. 13	" 18..	122	44	Medium	3	"	35	30	60
47	Rio Grande	" 18..	122	46	Weak	3½	"	35	20	60
48	Progress	" 18..	122	40	Medium	3	"	35	20	60
49	Herisson Bearded	" 19..	123	40	Weak	3½	Bearded..	34	40	60
50	Norval	" 8..	112	42	Stiff	3	Beardless.	34	40	60
51	Australian No. 23	" 18..	122	46	Stiff and bright.	3½	"	34	30	60
52	Minnesota No. 169	" 20..	124	46	"	3½	"	34	20	60½
53	Weldon	" 19..	123	44	Medium	3	"	34	20	60
54	Angus	" 12..	116	42	"	3	"	33	30	60
55	Chul Bidai	" 6..	110	36	Weak	3	Bearded..	33	10	60
56	Chester	" 11..	115	42	"	2½	Beardless.	33	10	60
57	Vernon	" 11..	115	46	Stiff and bright.	3½	Bearded..	32	50	60
58	Japanese	" 8..	112	40	Medium	2½	"	32	40	60
59	Adjini	" 4..	108	38	Weak	2	"	32	40	60
60	Dawn	" 11..	115	48	Stiff and bright.	3½	Beardless.	30	40	60

WHEAT.

FALL VERSUS SPRING SOWING.

Two varieties were included in this test, both varieties being sown September 22 for the fall test, and April 25 for the spring test. The land was in fairly fertile condition and was well prepared for the seed in each instance, and the fall sown plots received a light harrowing with the drag, when the spring sowing was made. The fall sown yield was much the heaviest, as will be seen by the accompanying record, and the grain is finer looking.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel..
				In.		Inches.		Bush.	Lbs.	Lbs.
Oregon Club..............	Sept.22	Jul. 29	...	44	Stiff.....	2	Beardless.	49	20	60
" "	Apr. 25	Aug. 20	117	44	Medium..	2	"	37	20	60
Blue Stem............	Sept.22	Jul. 29	....	46	Stiff.. .	3½	"	46	40	60
"	Apr. 25	Aug. 20	117	46	Medium..	3½	"	38	40	60
Blue Stem from Brandon....	Apr. 25	Aug. 20	117	46	Medium..	3½	"	37	20	60

EMMER AND SPELT.

Six varieties of emmer and spelt were sown this year. The land for these plots had produced a crop of potatoes following rape, which had been turned under and which left the land in very good condition. The yields of grain and straw are fairly good, but the straw was of no use for forage, as it was badly discoloured by rain before it was cured.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.
			In.		Inches.		Lbs.	Lbs.
South Dakota No. 3	Aug. 20..	132	42	Medium..	2½	Bearded..	5,100	2,130
South Dakota No. 524	" 20.	132	40	" ..	2½	" ..	4,950	2,040
Red Spelt....................	" 20..	132	42	" ..	3½	Beardless.	4,600	1,960
Thick Emmer	" 10..	122	40	" ..	2	Bearded..	5,000	1,920
White Bearded Spelt.........	" 12..	124	44	Stiff......	4	" ..	5,120	1,720
Common Emmer (Speltz).....	" 18..	122	40	Weak	2½	" ..	......	2,190

EXPERIMENTS WITH PEASE.

Forty-two varieties of pease were tested this year on plots of one-fortieth of an acre each. The soil was a fertile clay loam and all the plots were sown on April 21. The vines made a vigorous growth, and were well podded, but a considerable loss was sustained by shelling before they could be properly cured and housed.

PEASE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Pod.	Size of Pea.	Weight of Straw per plot.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Early Britain	Aug. 15	116	52	Strong	3	Medium	155	46	40	61½
2	Large White Marrowfat	" 21	122	52	"	3	Large	160	46	20	62
3	German White	" 17	118	54	"	3	Medium	163	46	20	62½
4	Carleton	" 17	118	70	"	2½	"	168	45	20	61¾
5	Arthur	" 15	116	50	"	3	Large	165	44	40	62
6	Macoun	. 15	116	56	Medium	2½	. .	180	44	20	61½
7	Chancellor	" 20	121	56	Strong	3	Medium	154	44	..	62½
8	Pearl	" 20	121	76	"	3	Large	165	42	40	60¾
9	Lanark	" 15	116	48	"	2½	"	168	42	20	61½
10	Mummy	" 18	119	58	"	3	Medium	148	42	..	62
11	Centennial	" 18	119	64	"	2½	"	170	41	30	61¾
12	Nelson	" 17	118	58	"	3	"	160	40	40	60
13	Paragon	" 22	123	62	"	2½	"	145	40	10	60½
14	White Wonder	" 21	122	61	"	2½	"	160	40	.	61
15	Agnes	" 21	122	62	"	3	"	156	39	20	61¼
16	New Potter	" 21	122	70	"	3	Large	143	39	10	61
17	Wisconsin Blue	" 18	119	64	"	2½	Small	155	39	..	61½
18	Black Eyed Marrowfat	" 22	123	60	"	3	Large	145	38	50	60
19	King	" 20	121	58	"	3	"	130	38	..	60
20	Crown	" 21	122	54	"	2½	Small	140	37	40	61
21	Golden Vine	" 18	119	64	"	2½	"	149	36	40	61¼
22	Pride	" 22	123	58	"	2½	Large	125	36	20	60½
23	Oddfellow	" 18	119	48	Medium	3	Medium	163	36	..	61
24	Canadian Beauty	" 18	119	58	Strong	3	Large	160	35	50	61
25	Prince Albert	" 18	119	56	Medium	2½	Small	138	35	30	61
26	Daniel O'Rourke	" 15	116	36	"	2½	"	140	35	30	61
27	Mackay	" 20	121	58	Strong	3	Medium	140	35	20	60
28	Kent	" 18	119	56	"	3	Large	166	35	10	60
29	Prussian Blue	" 20	121	50	"	3	Medium	125	34	50	61
30	Bruce	" 19	120	52	"	3	Large	165	34	10	60
31	Fergus	" 20	121	52	"	3	Medium	135	33	50	60½
32	Duke	" 19	120	60	"	2½	Large	148	33	40	60
33	English Grey	" 15	116	60	Medium	3	Medium	143	33	30	60
34	Archer	" 21	122	54	Strong	2½	"	135	33	20	60
35	Alma	" 22	123	58	"	2½	Large	125	33	10	60
36	Prince	" 20	121	48	"	3	"	143	33	..	60
37	Perth	" 17	118	52	"	2½	"	125	32	40	60½
38	Elliot	" 22	123	64	"	2½	Medium	125	32	30	60
39	Picton	" 20	121	54	"	2½	"	135	32	20	60
40	Victoria	" 18	119	54	Medium	3	"	130	32	..	60
41	Trilby	" 22	123	62	Strong	2½	"	150	31	40	60
42	Gregory	a 18	119	58	"	3	"	120	31	10	60

EXPERIMENTS WITH INDIAN CORN.

Twenty-three varieties of Indian corn were tested this year. All were planted May 20 and cut October 8 and 9. The land was a clay loam which had been ploughed the fall before, turning under a fine growth of clover. It was well harrowed several times during the spring, to start weed seeds and destroy the weeds. The crop was very late on account of cold and wet weather, but a few of the earlier sorts produced well, the ears being in roasting condition when cut. All the varieties were planted both in drills and hills. The rows were three feet apart and the hills three feet apart each way. The rows were thinned, leaving the plants six inches apart.

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	When Tasselled.	In Silk.	Early Milk.	Condition when Cut.	Weight per Acre grown in rows. Tons.	Lbs.	Weight per Acre grown in hills. Tons.	Lbs.
1	Red Cob Ensilage	Aug. 28	Sept. 2	Sept. 20	Late milk	31	480	22	1,980
2	Angel of Midnight	" 28	" 14	" 30	Early milk	26	580	23	800
3	Pride of the North	" 31	" 14	Oct. 8	"	26	350	22	1,760
4	Superior Fodder	Sept. 6	" 24	....	Ears formed	25	1,480	23	1,740
5	Early Mastodon	" 6	Oct. 3	....	In silk	24	1,940	18	1,400
6	Giant Prolific Ensilage	" 4	Sept. 26	....	Ears formed	24	1,720	22	1,430
7	Thoroughbred White Flint	" 8	" 30	....	In silk	24	1,500	23	860
8	Salzer's All Gold	" 8	" 30	....	"	24	1,280	22	1,430
9	North Dakota White	Aug. 28	" 12	....	Early milk	24	400	20	480
10	Mammoth Cuban	" 30	" 14	....	"	23	1,960	24	620
11	Eureka	" 30	" 15	....	"	22	1,760	23	420
12	Compton's Early	" 20	Aug. 28	Sept. 24	Late milk	22	220	21	1,010
13	Early Butler	" 28	Sept. 10	" 30	Early milk	21	1,560	19	280
14	Mammoth 8-rowed Flint	Sept. 4	" 15	Oct. 4	"	21	570	22	220
15	Champion White Pearl	" 6	" 24	" 12	"	20	480	21	1,120
16	King Philip	Aug. 28	" 20	....	Ears formed	20	40	18	1,620
17	Selected Leaming	" 30	" 28	....	Early milk	18	80	17	870
18	Cloud's Early Yellow	" 22	" 14	Oct. 4	"	17	1,860	17	430
19	Longfellow	" 24	" 12	Sept. 24	Roasting	17	870	17	1,860
20	King of the Earliest	Sept. 3	" 28	....	Ears formed	17	650	18	80
21	White Cap Yellow Dent	" 4	" 16	Sept. 30	Early milk	16	1,220	16	10
22	Evergreen Sugar	" 10	" 28	....	Ears formed	16	780	15	360
23	Sanford	" 10	" 26	....	"	15	1,46	12	1,740

INDIAN CORN SOWN AT DIFFERENT DISTANCES APART.

The same varieties that were used in this test last year were chosen again this year. They were planted alongside the main crop, both in drills and hills. In the drills the plants were thinned to about six inches and to three plants in the hills.

Three feet apart in drills appears to be the best distance, as that gives room for the best development of the plant, and at the same time no space appears to be wasted. These plots were planted May 20 and cut October 2.

INDIAN CORN.—SOWN AT DIFFERENT DISTANCES APART.

Name of Variety.	Distance in rows. in.	Distance in hills. in.	Condition when Cut.	Weight per Acre—grown in rows. Tons.	Lbs.	Weight per acre—Grown in hills. Tons.	Lbs.
Champion White Pearl	21	21	Early milk	17	540	16	340
" "	28	28	"	18	960	17	1,200
" "	35	35	Late milk	20	1,580	19	1,720
" "	42	42	"	17	1,640	17	980
Selected Leaming	21	21	Early milk	15	1,240	14	1,360
"	28	28	"	16	1,220	16	780
"	35	35	Late milk	20	260	18	1,510
"	42	42	"	18	300	17	430
Longfellow	21	21	Early milk	13	180	12	860
"	28	28	"	13	1,720	13	510
"	35	35	Late milk	19	1,600	18	1,400
"	42	42	"	18	1,280	18	520

TEST OF SUPERPHOSPHATE OF LIME ON INDIAN CORN.

This test was made on sandy land, which had produced a crop of clover the previous year, and a heavy aftermath was turned under early in September. The corn was planted in hills three feet apart each way, and the fertilizer was applied on the surface about the hills just as the corn was coming up, and worked in lightly with a hoe.

Name of Variety.	Date of Sowing.	When Cut.	Yield per Acre.		Remarks.
			Tons.	Lbs.	
1 Longfellow, superphosphate 100 lbs...	May 20	Oct. 2	18	1,950	Well eared and corn nearly glazed
2 " " 150 " ..	" 20	" 2	19	1,160	" " " "
3 " " 200 " ..	" 20	" 2	21	240	" " " "
4 " no fertilizer............	" 20	" 2	17	430	" but corn in early milk.

EXPERIMENTS WITH TURNIPS.

Twenty-one varieties of turnips were tested under practically the same conditions. The soil was a sandy loam, which was in clover in 1902, and in October of that year the aftermath was ploughed under and the land dressed with farm-yard manure during the winter which in spring was thoroughly worked into the soil with spade harrow and drag. Two sowings of each sort were made, 4 rows 100 feet long of each sort at each sowing. The first series of plots were sown May 13, and the second sowing May 27. The rows or drills were 30 inches apart, and, as in the mangels, the first sown have averaged the best returns. The yield has been calculated from the weight of crop obtained from the two centre rows in each plot.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Emperor Swede..........................	47	1,270	1,587	50	33	1,200	1,287	..
2	East Lothian..........................	45	1,410	1,519	10	38	1,550	1,292	30
3	Perfection Swede..........................	45	1,080	1,518	..	36	930	1,215	30
4	Hall's Westbury..........................	42	1,800	1,430	..	36	600	1,210	..
5	Imperial Swede..........................	41	1,820	1,397	..	39	1,200	1,320	..
6	Good Luck..........................	41	1,490	1,394	50	37	1,240	1,254	..
7	Mammoth Clyde..........................	41	1,160	1,386	..	39	540	1,309	..
8	Halewood's Bronze Top..........................	40	520	1,342	..	41	500	1,375	40
9	Elephant's Master..........................	40	355	1,339	15	36	765	1,212	45
10	New Century..........................	39	1,860	1,331	..	39	1,200	1,320	..
11	Bangholm Selected..........................	38	1,880	1,298	..	31	1,360	1,056	..
12	Jumbo..........................	38	890	1,281	30	38	1,880	1,298	..
13	Skirving..........................	37	1,240	1,254	..	35	620	1,177	..
14	Halewood's Bronze Top..........................	37	580	1,243	..	40	520	1,342	..
15	Drummond Purple Top..........................	36	1,755	1,229	15	33	495	1,108	15
16	Carter's Elephant..........................	36	1,260	1,221	..	38	1,220	1,287	..
17	Kangaroo..........................	35	1,610	1,193	30	34	1,630	1,160	30
18	Shamrock Purple Top..........................	34	1,960	1,166	..	32	680	1,078	..
19	Magnum Bonum..........................	33	1,320	1,122	..	36	1,590	1,226	30
20	Sutton's Champion..........................	33	660	1,111	..	36	1,920	1,232	..
21	Selected Purple Top..........................	31	1,360	1,056	..	37	1,240	1,254	..

EXPERIMENTS WITH MANGELS.

Sixteen varieties of mangels were sown in two sets of plots, one was sown on April 28, and the second May 12. Early sowing has given the best results. The soil was similar to that on which the turnips were sown, and its preparation and treatment the same. Four drills at thirty inches apart and one hundred feet long were sown in each case, and the yield per acre is computed from the produce of sixty-six feet of the two centre rows of each plot. Both sets of plots were dug October 22.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth Long Red	48	1,185	1,619	45	46	1,555	1,559	15
2	Half Long Sugar Rosy	41	830	1,380	30	38	1,220	1,287	..
3	Half Long Sugar White	40	25	1,333	45	46	1,390	1,556	30
4	Mammoth Yellow Intermediate	39	1,695	1,328	15	34	1,630	1,165	30
5	Selected Yellow Globe	39	1,200	1,320	..	35	1,940	1,199	..
6	Giant Yellow Intermediate	39	1,035	1,317	15	38	560	1,276	..
7	Lion Yellow Intermediate	39	540	1,309	..	33	1,145	1,119	5
8	Selected Mammoth Long Red	37	1,340	1,255	40	34	970	1,149	30
9	Giant Sugar	34	1,300	1,155	..	37	1,340	1,255	40
10	Prize Winner Yellow Globe	34	970	1,149	30	31	1,505	1,091	45
11	Giant Yellow Globe	33	1,980	1,133	..	28	265	937	25
12	Gate Post	33	1,815	1,130	15	36	270	1,204	30
13	Prize Mammoth Long Red	29	1,520	992	..	27	1,440	924	..
14	Triumph Yellow Globe	28	1,460	957	40	26	1,965	899	25
15	Leviathan Long Red	27	120	902	..	31	370	1,039	30
16	Yellow Intermediate	26	1,790	896	30	26	1,470	891	10

EXPERIMENTS WITH CARROTS.

Eleven varieties of carrots were tested. Two sowings were made of each sort, in drills thirty inches apart. The first sowing was made April 27, and the second May 11. All were pulled October 27. Four rows of each sort were put in at each sowing, and the yield was reckoned from the produce of 66 feet of the two centre rows of each plot. The land for these plots was similar to that used for the turnips, and its treatment and preparation was the same.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs.	2nd Plot. Tons.	Lbs.	Bush.	Lbs.
1	Mammoth White Intermediate	32	1,175	1,086	15	26	1,625	893	45
2	Giant Short White Vosges	31	1,690	1,061	30	28	430	940	30
3	Improved Short White	26	140	869	..	24	1,005	816	45
4	Ontario Champion	25	160	836	..	25	1,480	858	..
5	White Belgian	24	1,830	830	30	22	220	737	..
6	Carter's Orange Giant	23	860	781	..	22	55	734	15
7	Half Long White	21	570	709	30	22	385	739	45
8	Long Yellow Stump Rooted	20	920	682	..	18	1,290	621	30
9	New White Intermediate	19	940	649	..	17	1,640	594	..
10	Half Long Chantenay	19	610	643	30	17	1,310	588	50
11	Early Gem	18	960	616	..	18	630	610	30

EXPERIMENTS WITH SUGAR BEETS.

Eight varieties of sugar beets were tested on a mellow sandy loam that was in clover the previous year, was ploughed in September and disc-harrowed and cultivated in the fall and given a dressing of about twenty loads of barn-yard manure per acre during the winter. This was thoroughly worked into the soil in March and April, and the first series of plots sown in drills 30 inches apart on April 28, and the second sowing on May 12. All were harvested October 23. The yields have been computed from the produce of 66 feet of the two centre rows.

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs.	2nd Plot. Tons.	Lbs.	Bush.	Lbs.
1	Red Top Sugar	28	1,420	957	..	28	1,750	962	30
2	Danish Red Top	27	120	902	..	25	160	836	..
3	Improved Imperial	26	800	880	..	35	390	1,173	10
4	Danish Improved	26	635	877	15	27	1,440	924	..
5	Royal Giant	26	470	874	30	26	800	880	..
6	Vilmorin's Improved	23	1,190	786	30	22	1,540	759	..
7	French 'Very Rich'	19	280	638	..	22	880	748	..
8	Klein Wanzleben	18	960	616	..	20	590	676	30

POTATOES.

Fifty-six varieties of potatoes were tested. The soil was a clay loam on which oats and pease were grown in 1902, and which had a crop of clover in 1901. Clover was sown again with the oats and pease in 1902, and a splendid catch resulted which gave a fine mat of growth to turn under for the potatoes. Four rows of each sort, one hundred feet long, were planted May 19. All were sprayed July 6 and again two weeks later, except two test plots left unsprayed. When matured the two centre rows in each

case were dug, and the yield per acre computed from the weight of crop obtained from these two rows (66 feet). There was little or no blight this season, and in consequence there was no apparent benefit from the spraying.

POTATOES—TEST OF VARIETIES.

Number.	Name of Variety.	Total Yield per Acre.		Yield per Acre of								Form and Colour.
				Sound.		Rotten.		Market-able.		Un-market-able.		
		Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs	Bus.	Lbs.	Bus.	Lbs.	
1	Rochester Rose	466	24	466	24	None	...	373	24	93	..	Long, rose.
2	Cambridge Russet	459	48	459	48	"	...	323	32	136	16	Oblong, russet.
3	Reeve's Rose	400	24	380	24	20	..	340	..	40	24	Long, rose.
4	Country Gentleman	398	12	398	12	None	..	360	..	38	12	" pink and white.
5	Vanier	376	12	376	12	"	...	340	..	36	12	" red.
6	Early Rose	375	40	356	40	19	...	321	..	35	40	Oblong, rose.
7	American Wonder	360	48	342	48	18	...	291	48	51	..	Long flat, white.
8	Early Michigan	360	48	326	..	34	48	361	..	65	..	" white.
9	Rose No. 9	358	36	358	36	None	..	305	36	53	..	" rose.
10	Sharpe's Seedling	356	24	356	24	"	...	285	..	71	24	" round, rose.
11	Seedling No. 7	347	36	330	..	17	36	296	..	34	..	" red.
12	Irish Daisy	344	48	329	..	15	48	263	30	65	30	Round, white.
13	Pearce	344	48	344	48	None	..	274	..	70	48	Long, white and pink.
14	Sutton's Invincible	332	12	316	..	16	12	253	..	65	..	" white.
15	Dreer's Standard	323	24	323	24	None	..	273	24	50	..	Oval, white.
16	Uncle Sam	321	12	304	12	17	..	259	12	45	..	Round, white.
17	Rawdon Rose	316	48	269	18	47	30	221	18	48	..	Long, rose.
18	Brown's Rot-proof	316	48	316	48	None	..	237	48	79	..	" red.
19	Prolific Rose	316	48	284	..	32	48	228	..	56	..	" rose.
20	Maule's Thoroughbred	314	36	302	..	12	36	257	..	45	..	" "
21	Swiss Snowflake	312	24	312	24	None	..	266	24	46	..	" white.
22	Penn. Manor	310	12	294	42	15	30	250	..	44	42	" red.
23	Late Puritan	299	12	299	12	None	..	210	12	89	..	" white.
24	Early St. George	299	12	284	42	14	33	256	12	28	30	" "
25	I.X.L.	293	18	263	18	30	..	238	..	25	18	Long, flat, pink.
26	Carman No. 1	292	36	292	36	None	..	234	..	58	36	Round, white.
27	Irish Cobbler	290	24	276	..	14	24	236	..	40	..	" "
28	Bovee	286	..	257	..	29	..	219	..	38	..	Long, rose.
29	Green Mountain	285	54	285	54	None	..	230	54	55	..	" white.
30	Burnaby Seedling	281	36	267	36	14	..	217	36	50	..	" rose.
31	Early Norther	279	24	267	..	12	24	227	30	39	30	" pink.
32	Troy Seedling	277	12	277	12	None	..	251	12	26	..	" red.
33	McIntyre	275	..	275	..	"	...	205	..	76	..	" pink.
34	Early White Prize	268	24	268	24	"	...	214	24	54	..	Oblong, white.
35	Early Puritan	266	12	253	..	13	12	202	30	50	30	Long, white.
36	State of Maine	261	48	261	48	None	..	209	48	52	..	" pink.
37	Holborn Abundance	257	24	257	24	"	..	206	..	51	24	Round, white.
38	Delaware	253	..	253	..	"	..	190	..	63	..	" "
39	Early Sunrise	248	36	224	..	24	36	179	..	45	..	Long, rose.
40	Enormous	244	12	244	12	None	..	194	12	50	..	" white.
41	Vick's Extra Early	242	..	242	..	"	..	181	..	61	..	Round, pale rose.
42	Money Maker	239	48	239	48	"	..	190	..	49	48	Long, white.
43	Everett	236	30	189	30	47	..	141	54	47	18	" round, red.
44	Burpee's Extra Early	234	18	234	18	None	..	175	30	58	48	" rose.
45	Early Andes	233	12	209	12	24	..	177	12	32	..	Round, rose.
46	Clay Rose	232	6	232	6	None	..	185	36	46	30	Long, rose.
47	Canadian Beauty	231	..	231	..	"	..	172	30	58	30	" flat, pink.
48	Sutton's Supreme	228	48	228	48	"	..	171	18	57	30	" white.
49	Early Envoy	226	36	226	36	"	..	181	18	45	18	" pink and white.
50	Sabean's Elephant	211	12	200	42	10	30	166	42	34	..	" flat, white.
51	Lee's Favourite	200	12	200	12	None	..	160	12	40	..	" rose.
52	Carman No. 3	195	48	186	..	9	48	149	30	37	30	Oblong, white.
53	General Gordon	193	36	193	36	None	..	135	36	58	..	Oval, pink.
54	American Giant	189	12	189	12	.	..	161	12	28	..	Long, white.
55	Empire State	183	44	165	14	18	30	132	14	33	..	" pink and white.
56	Up to Date	140	48	140	48	None	..	105	48	35	..	Oval, white.

FERTILIZERS APPLIED TO POTATOES.

The land chosen for these plots was similar to that for the main crop of potatoes, having had clover turned under both of the two preceding years, and consequently the soil was well supplied with nitrogen. Early in the spring it received a dressing of muriate of potash at the rate of 100 lbs. per acre. All the plots were planted the same day and were treated alike in every way. The results show a decided profit in the use of the Thomas' slag.

POTATOES—FERTILIZER TEST.

Name of Variety.	Fertilizer applied.	Planted.	Dug.	Total Yield per Acre.	Yield per Acre of Sound.	Yield per Acre of Rotten.	Yield per Acre of Marketable.	Yield per Acre of Unmarketable.
				Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.
Dakota Red.	Thomas slag, 100 lbs. per acre.	May 19.	Sept. 28.	589 36	589 36	None...	501 ..	88 36
"	" 150 "	" 19.	" 28.	618 12	618 12	" ...	525 30	92 42
"	" 200 "	" 19.	" 28.	686 24	686 24	" ...	584 ..	102 24
"	Untreated	" 19.	" 28.	468 36	468 36	" ...	398 21	70 15

SUMMARY OF CROPS.

The following is a summary of the grain, roots and fodder crops raised on the Experimental Farm at Agassiz this season:—

	Tons.	Lbs.
Hay	53	1,000
Corn for silage and fed green	110	..
Turnips	42	..
Mangels	25	..
Carrots	8	..
Sugar beets	5	..
Oats	11	1,500
Pease	4	1,000
Wheat	2	500
Barley	2	1,700
Potatoes	5	..
Total	269	1,700

FODDER PLANTS.

The following fodder plants were tested this year, all on plots of one-fortieth of an acre each. None of the millets appear to be very successful here, and it is always practicable to get heavier yields of mixed grains, such as oats and pease, or oats and vetches, than of any of the millets, and the mixed grains are eaten as readily as are the millets, and the results of their feeding are more satisfactory.

EXPERIMENTS WITH MILLETS.

Plots 1 to 6 inclusive were sown May 21 and cut September 1.

Plot 1.—White Round Extra French:—

Stalks 30 to 36 inches long and not leafy, heads 2 to 2½ inches long; yield per acre when cut, 3 tons 1,920 lbs.

Plot 2.—Red Orenburg.

A poor uneven crop; stalks 30 to 48 inches long and not leafy; heads $2\frac{1}{2}$ to 3 inches long; weight when cut, 3 tons 960 lbs. per acre.

Plot 3.—Cat-tail Millet:—

Not an even crop; stalks 30 to 36 inches long and moderately leafy; heads 3 to 4 inches; weight when cut, 3 tons 640 lbs. per acre.

Plot 4.—Italian Millet:—

Stalks 32 to 40 inches long; heads 4 to 5 inches long; weight when cut, 3 tons 1,360 lbs. per acre.

Plot 5.—Pearl Millet:—

A poor uneven stand; stalks 36 to 50 inches long and very few leaves; heads 2 to 3 inches long; weight when cut, 3 tons 1,840 lbs. per acre.

Plot 6.—Hungarian Grass:—

A fair even stand and moderately leafy, but short in head and stalk; stalk 24 to 30 inches long and heads 3 to 5 inches; weight when cut, 3 tons 1,280 lbs. per acre.

EXPERIMENTS WITH MIXED GRAIN.

Plot 7.—Oats, Tares and Wheat mixed :—

Sown May 21 and cut September 1; an even luxuriant growth; cut when the oats were in the dough stage; weight when cut, 9 tons 1,460 lbs.

Plots 8 to 15 were sown May 7, and cut September 30.

EXPERIMENTS WITH SOJA BEANS.

Plot 8.—Soja Beans:—

Sown in drills 21 inches apart; an even stand and fairly well podded; pods 1 to $1\frac{1}{2}$ inches long, very leafy; length of stalk, 30 inches; yield per acre weighed when cut, 4 tons 200 lbs. per acre.

Plot 9.—Soja Beans:—

Sown in drills 28 inches apart, well podded, very leafy and well branched; stalks 30 inches long; weight when cut, 4 tons 1,200 lbs. per acre.

Plot 10.—Soja Beans:—

Sown in drills 35 inches apart; very branchy and leafy, pods 1 to $1\frac{1}{4}$ inches long and fairly plentiful; stalks 28 inches long; weight when cut, 4 tons 400 lbs. per acre.

EXPERIMENTS WITH HORSE BEANS.

Plot 11.—Horse Beans:—

Sown in drills 21 inches apart; a very patchy stand; pods short and few on the stalk; stalks about 24 inches long: weight when cut, 2 tons 1,440 lbs. per acre.

Plot 12.—Horse Beans:—

Sown in drills 28 inches apart; stalks 30 inches long and poorly furnished with pods; weight when cut, 2 tons 1,600 lbs. per acre.

Plot 13.—Horse Beans:—

Sown in drills 35 inches apart; stalks 32 inches long; pods short and not well filled; weight when cut, 2 tons 1,280 lbs. per acre.

Velvet Beans.

Plot 14.—Velvet Beans:—

Sown in drills 18 inches apart; very few of the seeds germinated, and none grew more than 2 inches and shortly died; not hardy enough for this climate.

Cow Peas.

Plot 15.—Whip-poor-will Cow Peas:—

Sown in drills 18 inches apart; made a weak straggling growth of not more than 6 inches; produced no crop worth mentioning.

SUNFLOWERS.

A plot of the Mammoth Russian Sunflowers were sown May 7 in drills three feet apart. They grew very vigorously and made very fine heads. The birds began to eat the seed as soon as it was full grown, and were very destructive. The seed is valuable for poultry.

EXPERIMENTS WITH FLAX.

Two varieties of flax were sown for seed May 7.

Improved Russian. Straw 36 inches long and very branching; yield of clean flax 14 bushels and 23 lbs. per acre. Harvested August 10.

Early Riga. Straw 34 to 38 inches long, not as well branched as Improved Russian and not as good a yield of seed. Ripe August 10; yield, 12 bushels and 8 lbs. per acre.

GARDEN VEGETABLES.

RADISHES.—Sown April 16.

Variety.	Fit for use.	Remarks.
Early Scarlet Turnip	May 10	Crisp, pleasant.
Olive Shaped Scarlet	" 16	Crisp, good.
French Breakfast	" 22	Very sweet and crisp.

LETTUCE.—Sown April 16.

Variety.	Fit for use.	Remarks.
Grand Rapids	May 14	Crisp, tender.
Ohio Cabbage	" 18	Crisp, tender, sweet.
Black Seeded Simpson	" 20	Very crisp and good.
Toronto Gem	" 28	Firm, sweet, crisp.
All The Year Round	" 30	White, solid, sweet.

CARROTS.—Sown April 16.

Variety.	Fit for use.	Remarks.
Parisian Forcing	June 18	Crisp, sweet, good.
French Horn	" 22	Very fine flavoured.
Luc Half Long	July 10	Crisp, sweet, pleasant.
Long Blood Red	" 18	Crisp, very good.
Half Long Danvers	Aug. 8	Very fine.

TABLE TURNIPS.—Sown May 1.

Variety.	Fit for use.	Remarks.
Extra Early White Milan	June 16	Very sweet and good.
White Six Weeks	" 20	Sweet, fine flavour.
Red Top Strap Leaf	" 29	Crisp, good.
White Stone	July 8	Very solid, crisp.
Robertson's Golden Ball	" 14	Very fine flavour.
Hazard's Swede	Aug. —	Very sweet, crisp, good.

ONIONS.—Sown April 17.

Variety.	Remarks.
Early White Welsh	Uniform size, firm, mild, good flavour.
Large Red Wethersfield	Medium, large, solid good.
Danvers Yellow	Flat, medium size, solid.
Market Favourite	An even regular grower, mild, good flavour.
Trebons Large Yellow	Large, handsome, solid, mild.
Paris Silver Skin	Very handsome, fine flavour.

CABBAGE.—Sown in hot-bed April 20, and transplanted May 26.

Variety.	Fit for Table	Remarks.
Jersey Wakefield	July 18	Heads solid, crisp, white; a uniform header.
Extra Early Express	" 24	Heads small, firm, good quality, an even header.
Extra Early Midsummer Savoy	" 28	Heads soft but flavour very fine, extra quality.
Paris Market	" 30	Variable in size and firmness, quality good.
Early Winningstadt	Aug. 20	A very nice header; heads uniform in size, firm, white, sweet, quality good.
Drumhead Savoy	" 26	Heads medium size, solid, white, extra fine flavour.
Mammoth Red Rock	" 28	A good header; heads medium size, solid, very red, good.
Green Globe Savoy	Sept. 10	A regular header; heads of medium size, solid, crisp, fine flavour.
Glory of Enkhousen	Oct. —	A regular header, heads large, solid, very crisp and sweet.
Fottler's Drumhead	" —	Heads, large, solid, white, good quality; good keeper.
Fielder Kraut	" —	A fine, medium head, solid, white, sweet.
Lupton	" —	A regular header; heads large, solid, good.
Quintal Drumhead	" —	Heads large, solid, white, fine quality.
Danish Ball Head	" —	Heads medium size, very solid, sweet and of fine flavour; a good keeper.
Zenith	Oct. —	A regular header, head of medium size; solid, tender, fine quality, very good.
Marblehead Mammoth	" —	Heads large, but sometimes soft; quality medium.
Large Red Drumhead	" —	A fairly regular header; heads very solid, deep red, tender, good.

CAULIFLOWER.—Sown April 20 and transplanted May 26.

Extra Early Snowflake	Aug. 4	Heads large, solid, crisp, very white, good.
Extra Early Dwarf	July 28	Heads medium to large, solid, crisp, sweet, very fine.
Half Early Paris	" 24	Heads small, crisp, of good flavour, very fine.

BROCOLI.—Sown April 20 and transplanted May 26.

Extra Early White	Aug, 20	Heads firm, of medium size, white, crisp, fine flavour.

BRUSSELS SPROUTS.—Sown April 20 and transplanted May 26.

Dwarf Improved	Oct. 24	Sprouts solid, crisp, sweet, very good.

BEETS.—Sown May 1.

Name.	Fit for use.	Remarks.
Egyptian	July 9	Solid, very dark red, sweet.
Nutting's Dark Red	" 18	Good size, very dark red.
Edmands Early Blood Turnip	" 18	Sweet, good, very even sized, good colour, pleasant.
Long Smooth Blood	Aug. 28	Smooth, long, sweet, very dark red, very good.

BEANS.—Planted May 1.

Early Mohawk	July 10	Dwarf grower, but very productive; pods 4 to 5 in. long, crisp, pleasant flavour.
Dwarf Golden Skinless	" 13	A dwarf grower, but very productive; pods 2½ to 4 in. long, crisp, stringless and good.
Early China	" 13	A very dwarf grower, productive; pods 4 to 5 in. long, of a pleasant flavour.
Extra Early Edible Podded	" 15	Dwarf grower, productive, good flavour; pods 4 to 5 in. long.
Royal Dwarf Kidney	" 16	A bushy grower, fairly productive and of a pleasant flavour.
Long Yellow Six Weeks	" 18	A bushy grower, productive; pods 3 to 5 in. long, crisp, pleasant, good.
Improved Early Red Valentine	" 19	A strong bushy grower and productive; pods 3 to 5 in. long and of very fine flavour.
Crystal White Wax	" 19	A bushy grower, fairly productive; pods plump, crisp, 4 to 5 in. long with a very pleasant flavour.
Fame of Vitry	" 20	A strong grower, productive; 4 to 6 in. long, crisp, tender, sweet, pleasant, good.
Dwarf, Emperor of Russia	" 20	A bushy strong grower, very productive; pods 4 to 5 in. long, crisp, and of very fine flavour.
Dwarf, Inexhaustable	" 22	Very dwarf, bushy, productive; pods 3 to 5 in. long; crisp very pleasant, good.
Dwarf, Black Speckled	" 24	Dwarf, bushy, productive; pods 4 to 6 in. long; fleshy, crisp, juicy with a very pleasant flavour.

GARDEN PEASE.—Sown April 16.

Nott's Excelsior	June 21	Vines 16 in. long, well podded; pods 2 to 2½ in. long and well filled, peas sweet and tender.
Alaska	" 21	Vines 24 in., well podded; pods 2½ to 3½ in. long and well filled with medium sized peas of fine quality.
American Wonder	" 24	Vines 14 to 18 in. long, well podded; pods 2 to 3 in. long and filled with medium sized sweet tender peas.
Premium Gem	" 30	Vines 20 to 24 in. and very well furnished pods 2 to 3 in. long, pea of medium size, sweet and tender with a pleasant flavour.
Sutton's May Queen	July 3	Vines 24 to 30 in., fairly well podded; pods 2 to 3 in. long, well filled, pea of medium size, quality good.
McLean's Advancer	" 5	Vines 26 to 30 in. long and fairly well loaded; pods 3 to 3½ in. long, well filled with medium size peas tender and sweet and of very fine quality.
Heroine	" 8	Vines 20 to 24 in. long, pods 3 in. long well filled, peas large, sweet, tender and of very fine flavour.
Gradus	" 8	Vines 30 to 36 in. long and well podded; pods 3½ to 5 in. long and filled with large peas sweet and of superior flavour.
Sutton's Conqueror	" 9	Vines 2 ft. long, well loaded with pods of 3 to 5 in. long, peas large, sweet and of very fine quality.
Duke of Albany	" 10	Vines 30 to 36 in. long, well furnished with pods 2½ to 3½ in. long containing medium sized very sweet fine flavoured peas.
Admiral	" 11	Vines 3 to 3½ ft. long, very well podded; pods 2½ to 3½ in. long, well filled with large peas of very fine quality.
Rent Payer	" 11	Vines 24 to 30 in. long, well loaded with pods 4 to 5 in. long, pea large, sweet, tender, very good.
New Dwarf Telephone	" 18	Vines 18 in. long, very productive; pods 3 to 3½ in. long, pea large, sweet, tender and of fine flavour.

GARDEN PEAS—Sown April 16.

Name.	Fit for use.	Remarks.
Pride of the Market	July 12	Vines 18 in. to 2 ft. long and fairly productive; pods 2 to 3½ in. long, well filled with medium sized peas of fine quality.
Stratagem	" 13	Vines 18 to 24 in. and well podded, pods 3 to 4 in. long, pea large, sweet and of very fine quality.
Shropshire Hero	" 13	Vines vigorous and 2½ to 3 ft. long, productive, pods 2½ to 4 in. long, well filled with large peas of very superior flavour.
Horsford's Market Garden	" 13	Vines 2 to 2½ ft. long, vigorous and productive, pods 2 to 3 in. long, peas of medium size and very fair quality.
Sutton's Perfection	" 13	Vines stout and 1½ to 2 ft. long, productive, pods long and well filled with 6 to 10 large peas of good quality.
Sutton's Windsor Castle	" 15	Vines 2 to 2½ ft. long, moderately productive, pods 3 to 4½ in. long, peas large, sweet, tender and of very fine flavour.
Sutton's Matchless Marrow	" 15	Vines 1½ ft. to 2 ft. long, well podded, pods 3 to 4 in. long, peas large sweet and of pleasant flavour.
Sutton's Late Queen	" 22	Vines 15 to 18 inches long, well furnished with large pods containing 6 to 10 very large sweet tender peas of first quality.
Telephone	" 22	Vines 2 to 2½ ft. long well podded, pods 2 to 3 in. long and well filled with large sweet peas of very fine flavour.

KOHL RABI—Sown May 10.

White Goliath	July 22	Crisp, sweet, mild and of pleasant flavour.

SQUASH—Planted May 2.

Golden Bush	July 29	Productive, sweet and of pleasant flavour.
Bush Fordhook	Aug. 8	A vigorous grower and very productive, fruit small, solid, very thick fleshed and very fine in flavour.
English Vegetable Marrow	July 30	A strong grower and productive, very fine flavour, fit for table July 30.
Delicata	Sept. to Jan.	Vines strong growers and very productive, squash 9 to 11 in. long and 3½ in. in diameter, very thick, flesh of the finest quality.

Name.	Remarks.
Boston Marrow	A vigorous grower and productive. Thick fleshed, sweet, dry, of fine flavour. Fit for table September 4.
Essex Hybrid	Vines vigorous and very productive. Flesh fine grained, sweet and of a fine flavour. Fit for table September 10.
Pike's Peak	A very strong grower and very productive. Very solid, flesh dry, sweet, fine-grained, good. Fit for use September 10.
Golden Bronze	Vine a strong grower and productive. Squash medium size, very thick fleshed. Flesh very sweet, fine-grained, dry and of extra fine flavour. Season September.
Marble-head	Vines vigorous and productive. Squash solid, thick fleshed, sweet, fine-grained and of very fine flavour. Season, September.
Chicago Warted Hubbard	Vines productive. Flesh very thick, sweet, fine-grained and of fine flavour. Season, September.

SWEET CORN.—Planted May 1.

Early Minnesota	Stalks 4½ to 5 feet high, often two good ears on a stalk. Fit for table August 23. Ears 4 to 6 inches long, well filled, corn sweet and fine flavoured.
Early Crosby	Stalks 5 feet high and fairly productive. Fit for table August 26. Ears rather small but very well filled with very sweet, fine flavoured corn.

SAMPLES DISTRIBUTED.

It is gratifying to observe the increase in the interest taken in the work of the farm. This is evident from the increase in the correspondence and the large number of requests for seed grain, nuts and other tree seeds, as well as for scions of fruit trees.

Packages of scions and cuttings	384
3 lb. samples of potatoes	310
3 " oats	163
3 " pease	148
3 " wheat	217
3 " barley	128
Nut and tree seeds, bulbs, &c.	213
Total	1,563

CORRESPONDENCE.

Number of letters received, 2,767; number of letters sent out, 2,570.

APPLES.

The season in the spring was unfavourable. The weather was cold and showery, and although the trees were full of bloom, many varieties did not set fruit, and the crop has been light in most cases. The quality, however, was better and the fruit freer from scab than in previous years. The following new varieties fruited for the first time this year :—

1. *James Welch.* Tree a strong grower. Fruit large, oblong, conical. Stalk short, cavity narrow and shallow, calyx small, basin narrow, shallow and ribbed. Skin pale yellowish green, with many grey dots sprinkled over the whole surface. Flesh coarse, white, not juicy, sharply acid. A good cooking apple. Season August.

2. *Summer Rose.*—Tree a slow grower. Fruit small, round. Stalk medium in length, slender. Calyx small, closed. Basin smooth, medium, deep and wide. Skin clear yellow, with a bright red cheek. Flesh white, tender, juicy, sprightly, with a very pleasant flavour. Season August.

3. *Sweet Russet.*—Tree a strong grower. Fruit small, oblate. Stem long and slender. Cavity wide and deep. Calyx closed. Basin wide and shallow. Skin russet, with a russet red cheek. Flesh white, moderately juicy, sweet and pleasant. Season September.

4. *Reine des Pommes.*—Tree a moderate grower. Fruit of medium size, conical. Stalk short, slender. Cavity deep and narrow. Calyx small. closed. Basin narrow and shallow. Skin pale yellow, striped with bright red. Flesh white, crisp, fine-grained, pleasant, sprightly, acid, of good flavour. Season August.

5. *Avista.*—Tree a strong grower. Fruit of medium size, roundish oblate. Stalk medium in length and slender. Cavity round and shallow. Calyx large, closed. Basin wide and shallow. Skin yellowish white, striped and splashed with bright red. Flesh white, firm, crisp, juicy, pleasant and sub-acid. Season early September.

6. *Yorkshire Greening.*—Tree a strong grower. Fruit above medium size, oblate, somewhat ribbed. Stem short. Cavity small. Calyx medium, open. Basin shallow. Skin greenish yellow, with stripes of dull red and small patches of russet. Flesh yellowish white, firm, crisp, moderately juicy, sub-acid. Season early.

7. *Kerry Pippin.*—Tree a vigorous grower. Fruit of medium size, roundish, oblong. Stalk long and slender. Cavity small. Calyx small, closed. Basin small. Skin pale yellow, with sometimes a faint blush in the sun. Flesh yellowish, tender, crisp, moderately juicy, rich, sugary, with a pleasant flavour Season October.

8. *Golden Spire.*—Tree a moderate grower. Fruit of medium size, oblong, conical, somewhat ribbed. Stem short, slender. Cavity deep and narrow. Calyx large, closed. Basin shallow, narrow and ribbed. Skin bright golden yellow, occasionally with a blush on the sunny side. Flesh white, juicy, tender, mild and pleasantly acid. Season September.

9. *Steward.*—Tree a poor grower. Fruit of medium size, globular. Stem short. Cavity very small and shallow. Calyx large and open. Basin wide and deep. Skin greenish yellow, with red stripes on sunny side. Flesh white, crisp juicy, nearly sweet, with a pleasant flavour. Season September.

10. *Gold Ridge Seedling.*—Tree a free grower. Fruit below medium size, roundish, oblate. Stem long, slender. Cavity medium to large. Calyx small, closed. Basin narrow and shallow. Skin dull, greenish yellow, with sometimes a faint-blush. Flesh white, crisp, juicy, pleasantly sub-acid. Season September.

11. *Winter Golden.*—Tree a vigorous grower. Fruit medium to small, roundish, oblate. Stem slender. Cavity narrow and deep. Calyx small, closed. Basin narrow and of medium depth. Skin clear golden yellow, with sometimes a faint blush in the sun. Flesh yelowish white, moderately juicy, sweet and of pleasant flavour. Season September.

12. *Northern Dumpling.*—Tree a vigorous grower. Fruit above medium size, conical, ribbed. Stalk short, cavity small, calyx medium and closed. Basin deep and corrugated. Skin yellowish white, nearly overspread with dull red and sprinkled with small russet dots. Flesh white, crisp, juicy, sprightly with a pleasant flavour. Season October.

13. *Looker Winter.*—Tree a vigorous grower. Fruit medium to small, globular. Stalk short and slender. Cavity small. Calyx large, closed. Basin wide, shallow and corrugated. Skin yellow with stripes and splashes of deep red. Flesh yellowish, crisp, mildly sub-acid. Season October.

14. *Brierly Wood.*—Tree a strong grower. Fruit small to medium, globular. Stem short. Cavity deep and narrow. Calyx small, closed. Basin deep and narrow. Skin russet yellow, with a faint reddish blush in the sun and sprinkled with russet dots. Flesh white, tender, a little granular, moderately juicy, mildly sub-acid with a pleasant flavour. Season October.

15. *President de Fays du Monceau.*—Tree a vigorous grower. Fruit large, oblate, a little conic. Stalk short, slender. Cavity small. Calyx closed. Basin narrow and deep. Skin yellow with a little red in the sun. Flesh yellowish white, crisp, tender, mild, nearly sweet. Season October and November.

16. *Imperial.*—Tree a moderate grower. Fruit of medium size, conical. Stalk medium. Cavity shallow and wide. Calyx medium and closed. Basin shallow. Skin greenish yellow, striped with dull red. Flesh white, juicy, tender and pleasantly sub-acid. Season October and November.

17. *Clarke's Pearmain.*—Tree a strong grower. Fruit medium or below, roundish oblate, slightly conical. Stalk short. Cavity small. Calyx small, closed. Basin small. Skin greenish yellow, nearly covered with dull red and many russet dots. Flesh yellow, firm, crisp, sweet and pleasant. Season November.

18. *Calville de Maussion.*—Tree a vigorous grower. Fruit of medium size. Stalk short. Cavity deep and wide. Calyx small, closed. Basin small and corrugated. Skin yellowish with a faint blush on sunny side. Flesh white, crisp, juicy, sprightly, pleasant. Season November.

19. *Hoary Morning.*—Tree a strong grower. Fruit large, flattish, conic. Stalk short. Cavity deep and wide. Calyx small, closed. Basin small. Skin pale yellowish green splashed with red, and with a thin white bloom. Flesh white, firm and briskly sub-acid. Season November.

20. *Friandise.*—Tree a vigorous grower. Fruit of medium size, oblong, oval. Stem short. Cavity small. Calyx small, closed. Basin narrow and shallow. Skin green, nearly covered with stripes and splashes of dull red, and a few small patches of russet. Flesh white, firm, juicy and pleasantly sub-acid. Season November and December.

21. *Cornish Gilliflower.*—Tree a strong grower. Fruit of medium size, roundish, conical. Stalk short. Cavity narrow and shallow. Calyx small, closed. Basin narrow and shallow and plaited. Skin greenish yellow, nearly covered with red. Flesh yellowish, tender, moderately juicy, aromatic and pleasantly sub-acid. Season November.

22. *Ash-leaved Reinette.*—Tree a vigorous grower. Fruit of medium size or below medium, roundish, conical. Stem short, slender. Cavity deep and narrow. Calyx small, closed. Basin small. Skin yellowish, with a bright red cheek in the sun. Flesh yellowish, firm, crisp, moderately juicy, pleasantly sub-acid. Season November.

23. *Forfar Pippin.*—Tree a vigorous grower. Fruit medium to large, roundish, globular, ribbed. Stem long. Cavity deep and wide. Calyx large, with an open basin, wide, shallow and corrugated. Skin dull greenish yellow, liable to be scabby. Flesh yellowish, firm, crisp, sprightly. Season November and December.

24. *De Sermoise.*—Tree a feeble grower. Fruit of medium size, globular, slightly conical. Stem short. Cavity medium. Calyx small, closed. Basin wide and shallow. Skin greenish yellow, striped with deep red. Flesh white, crisp, firm, juicy and of a pleasant flavour, mildly sub-acid. Season December.

25. *Castle Major.*—Tree a slow grower. Fruit of medium size, oblate, conical. Stem short. Cavity medium to small. Calyx small, closed. Basin small. Skin greenish yellow, with a dull red cheek and sprinkled with whitish dots. Flesh firm, juicy and briskly acid. Season December.

26. *Wm. Penn.*—Tree a moderate grower. Fruit small, round, flat. Stem short. Cavity deep and narrow, a little russeted. Calyx small, closed. Basin wide, shallow, corrugated. Skin yellow, with a red cheek. Flesh yellowish, crisp, juicy, sub-acid, with a pleasant flavour. Season December.

27. *Reinette Titus.*—Tree a moderate grower. Fruit above medium size, globular. Stem short. Cavity deep and narrow. Calyx small, closed. Basin narrow. Skin greenish yellow, with considerable russet about the stem, and a bronze red cheek, sprinkled with light dots. Flesh firm, yellowish, juicy, a mild pleasant acid. Season December.

28. *Shackleford.*—Tree a strong grower. Fruit of medium size, conical. Stem of medium length. Cavity moderately deep and wide. Calyx small, open. Basin wide and shallow. Skin yellow, with stripes and splashes of red in two shades. Flesh white, crisp, tender, juicy, mildly sub-acid, with a pleasant flavour. Season December.

29. *Reinette Gris du Portugal.*—Tree a strong grower. Fruit of medium size, oblate. Stalk short. Cavity wide and shallow. Calyx small, closed. Basin narrow and deep. Skin a russet brown, with many dots. Flesh firm, juicy, mildly acid, with a pleasant flavour. Season December.

30. *Reinette de Madère.*—Tree a strong grower. Fruit of medium size, conical. Stalk short. Cavity narrow and shallow. Calyx small, closed. Basin narrow and moderately deep, corrugated. Skin dull russet green, with a little russet about the stalk. Season January.

31. *Green Reinette.*—Tree a strong grower. Fruit below medium size, oblate, flattened at stem. Stem short. Cavity narrow and shallow. Calyx small, closed. Basin shallow and narrow. Skin yellowish with a bronze red cheek and a little ribbed about calyx. Season January.

32. *Duke of York.*—Tree a poor grower. Fruit of medium size, oblate. Stem moderately long. Cavity wide and deep. Calyx large and open. Basin wide and shallow. Skin green, striped and splashed with dull red and a few grey specks. Flesh crisp, white, juicy and pleasantly acid. Season winter.

33. *American Beauty.*—Tree a strong grower. Fruit of medium size, roundish inclining to conic. Stalk of medium length and slender. Cavity medium, with russet. Calyx small, closed. Basin of medium depth. Skin yellow, nearly covered with dark red. Flesh white, juicy, mildly sub-acid, with a pleasant slightly aromatic flavour. Season winter.

34. *Bow Hill Pippin.*—Tree a medium grower. Fruit of medium size, globular, slightly angular. Stem short. Cavity narrow, shallow. Calyx closed. Basin wide and deep. Skin greenish yellow, with a brownish red cheek and a few grey dots. Flesh crisp, white and mildly acid. Season winter.

35. *Calville Rose.*—Tree a strong grower. Fruit of medium size, oblong, conical and ribbed. Stalk short. Cavity deep and wide. Calyx closed. Basin narrow and shallow and deeply corrugated. Skin yellow with a dull red cheek. Season late winter.

36. *Reinette Tardive.*—Tree a strong grower. Fruit of medium size, oblate, conical. Stem short. Cavity small. Calyx small, closed. Basin narrow and flat, slightly corrugated. Skin yellow, with a brownish red cheek and many grey dots. Season late winter.

37. *Reinette de Breda.*—Tree a strong grower. Fruit of medium size, oblate, conical, a little angular. Stem short. Cavity narrow and shallow. Calyx large, open. Basin wide and shallow, somewhat corrugated. Skin greenish yellow, with a red blush and sprinkled freely with grey dots. Season late winter.

38. *Grillot.*—Tree a vigorous grower. Fruit small, oblong, globular. Stem long. Cavity wide and deep. Calyx large, open. Basin wide and deep. Skin golden yellow, with a warm blush. Season late winter.

39. *Grande Breitache.*—Tree a strong grower. Fruit of medium size, oblate. Stem short. Cavity shallow. Calyx closed. Basin wide and shallow. Skin yellow, with pale red streaks and splashes and a few dark brown specks, inclined to be scabby. Season late winter.

40. *Reinette de Willy.*—Tree a strong grower. Fruit above medium size, oblate, a little angular. Stem long. Cavity deep and wide. Calyx large, closed. Basin wide, shallow and corrugated. Skin greenish yellow, with a faint blush on sunny side and sprinkled with white dots. Season late winter.

41. *Reinette de la Rochblin.*—Tree a strong grower. Fruit medium to large, globular. Stem short. Cavity narrow and deep. Calyx small, closed. Basin wide and deep. Skin russet green, with a reddish brown cheek, and a few gray dots. Season late winter.

42. *Bayard.*—Tree a vigorous grower. Fruit large, conical. Stem short. Cavity narrow and deep. Calyx small, closed. Basin deep and narrow. Skin yellow, with a small blush, a little reddish russet about the calyx and a few white dots. Season late winter.

43. *Golden Queen.*—Tree a strong upright grower. Fruit small, conical. Stem short. Cavity small. Calyx small, closed. Basin narrow and shallow. Skin golden yellow, with a red cheek and sprinkled with white dots. Season late winter.

44. *Reinette de Damason.*—Tree a moderate grower. Fruit small, roundish, oblate. Stem long, slender. Cavity small. Calyx small, closed. Basin shallow and narrow. Skin bronze russet, with a red cheek. Season winter.

45. *Oelkofen Pippin.*—Tree a feeble grower. Fruit small, round flat. Stem short. Cavity narrow and deep. Calyx large, open. Basin wide and shallow. Skin golden yellow, nearly overspread with deep red. Season winter.

46. *Ohio Nonpareil.*—Tree a medium grower. Fruit large, roundish, oblate. Stem short. Cavity small. Calyx medium and open. Basin narrow and deep. Skin clear yellow, with a bright, clear red cheek. Season winter.

47. *Greaves' Pippin.*—Tree a feeble grower. Fruit of medium size, roundish, oblate, ribbed, somewhat angular. Stem short. Cavity medium, deep and wide. Calyx medium, closed. Basin wide and shallow. Skin dull yellow, with a few russet dots. Season winter.

48. *Poorhouse.*—Tree a strong grower. Fruit above medium size, roundish, oblate, a little conical. Stem short and stout. Cavity moderately deep and wide. Calyx large, partly open. Basin small. Skin yellow, with a faint blush in the sun and a few russet dots. Season late winter.

49. *Nero.*—Tree a strong upright grower. Fruit below medium size, roundish, oblate. Stalk slender and short. Cavity narrow and shallow. Calyx small, closed. Basin wide, flat and corrugated. Skin yellowish white, nearly covered with bright red russet in cavity about stem, and a few yellowish dots. Season winter.

PEARS.

The pear trees made a strong healthy growth in 1902, and were very full of bloom this spring, but the weather was cold and wet all the time of blossoming, and the fruit failed to set. A few varieties bore good crops, but a few specimens were the rule on most trees and no fruit at all on many varieties. Bartlett, La France, Dr. Jules Guyot, Clairgeau, Bosc and Emile de Heyst gave fair crops. The Emile de Heyst is one of the most satisfactory of the late autumn pears, being a reliable cropper and of very fine quality.

The following new sorts fruited for the first time:—

1 *Hutcherson.*—Tree a strong grower and an early and free producer. Fruit of medium size, broad at calyx and tapering to the stem. Stem one inch long and slender. Skin greenish yellow, with a few small gray dots. Flesh white, juicy, melting, sweet with no pronounced flavour. Season early August.

2. *July Doyenne.*—Tree a medium grower and not productive. Fruit below medium, obovate pyriform tapering to stem which is about an inch long. Calyx small, open. Basin shallow and open. Skin greenish yellow, with a dull reddish cheek. Flesh whitish, sweet, moderately juicy and a little gritty. Season August.

3. *Red Bergamot.*—Tree a poor grower and not productive. Fruit below medium size and nearly round. Stem medium in length. Calyx small, open. Basin wide, shallow. Skin pale yellow, with a dull red over most of the surface. Flesh yellowish, juicy, soft, sweet with a pleasant flavour. Season early September.

4. *Bergamot d'Ete.*—Tree a moderate grower and an early bearer. Fruit of medium size, obtuse, pyriform. Stem short. Cavity moderately deep. Calyx small, open. Basin wide, shallow. Skin yellow, freely sprinkled with gray dots, and with a bronze red cheek. Flesh yellowish, juicy, fine grained, buttery, sweet, with a good flavour. Season September.

5. *Beurre Amande.*—Tree a vigorous grower, but a poor producer. Fruit of medium size, acute, pyriform. Stalk moderately long, slender, curved. Calyx medium and open. Skin russet green. Flesh white, juicy, buttery, sweet with a pleasant flavour. Season September.

6. *Yat.*—Tree a moderate grower, and a poor bearer. Fruit small, obovate, pyriform. Stem short. Calyx large, open. Skin light green, with a few pale greenish spots. Flesh white, juicy, sweet, tender; decays very soon after ripening. Season September.

7. *Honey.*—Tree a vigorous grower. Fruit of medium size, roundish, pyriform. Stalk short and stout. Calyx open. Basin wide and shallow. Skin yellow, with a reddish cheek, and sprinkled with russet dots. Flesh a little coarse, not very juicy, sweet, with a pleasant flavour. Season September.

8. *Sutton's Great Britain.*—Tree a vigorous grower. Fruit large, obtuse, pyriform. Stem medium in length and stout, set in a narrow small cavity. Calyx large, open. Basin shallow. Skin yellow with a small red cheek and patches of russet, with many russet dots. Flesh white, juicy, a little coarse, sweet, with a pleasant flavour. Season September.

9. *Baronne de Mello.*—Tree a moderate grower. Fruit of medium size, acute pyriform, curved. Stem long, curved and fleshy at base. Calyx medium and closed. Skin yellow, with a reddish cheek and many russet dots. Flesh whitish, a little coarse, juicy, sub-acid, vinous, very pleasant; quality good. Season October.

10. *Esperine.*—Tree a vigorous grower. Fruit medium to large, pyriform. Stalk short, stout, with a lip or enlargement on one side. Calyx small, closed. Flesh white, juicy, buttery, sweet, with a very pleasant flavour. Season October.

11. *Kopertscher.*—Tree a strong grower. Fruit of medium size, roundish, oblate, or nearly globular. Stalk short and slender. Calyx large, open. Skin yellowish green, with small patches of russet and many brown dots. Flesh white, juicy, buttery, sweet, with a very pleasant flavour. Season October.

12. *Beurre de Ghelin.*—Tree a vigorous grower. Fruit medium to large, oblong, oval. Stem short, stout. Calyx large, open. Skin yellowish, with a little russet in patches. Flesh yellowish, juicy, fine grained, sweet with a pleasant flavour. Season November.

13. *Duhamel du Monceau.*—Tree vigorous. Fruit of medium size, roundish, pyriform. Stalk long and set at an angle in a slight cavity. Calyx open. Skin

pale greenish yellow, with a bronze cheek in the sun and many brown dots. Flesh whitish, fine-grained, juicy, buttery, sweet, a little vinous, with a very pleasant flavour. Season November.

14. *Beurre Lade.*—Tree a moderate grower. Fruit above medium size, oblong, obtuse, pear-shaped. Stalk long, curved and set in a small depression. Calyx small. Basin shallow, with knobby edges. Skin yellow with a little red in the sun. Flesh white, fine-grained, juicy, very sweet, with a fine aromatic flavour. Season November.

15. *Olivier de Serres.*—Tree a strong grower. Fruit above medium size, with a roundish form. Stem of medium size. Cavity moderately wide, shallow. Calyx large, open. Basin wide and shallow. Skin yellow, with patches of russet and sprinkled with reddish dots. Season winter.

16. *Vauquelin.*—Tree a strong grower. Fruit small, oblong, pyriform. Stem of medium length, stout, enlarged at the base. Calyx large, open. Skin russet yellow, with a dull red cheek. Season winter.

17. *Baronsbirne.*—Tree a vigorous grower. Fruit large, obovate, acute pyriform. Stalk long, curved, in a small cavity with a lip. Calyx large, open. Basin narrow and shallow. Skin pale greenish yellow, with many small reddish brown dots. Season winter.

18. *Colmar Dumortier.*—Tree a slow grower. Fruit of medium size, obtuse, pyriform. Stalk short. Cavity shallow, with a lip. Calyx small, open. Basin wide and shallow. Skin yellowish green, with dots and splashes of russet. Season winter.

19. *Franc-real.*—Tree a medium grower. Fruit small, roundish, pyriform. Stalk one inch long and set even. Calyx large, open. Skin dull yellow, with many brown dots and a bronze red cheek. Season winter.

20. *Charles Cognee.*—Tree a slow feeble grower. Fruit small ovate, obtuse, pyriform. Stalk of medium length, a little angular. Calyx small open. Basin narrow and shallow. Skin pale yellow, with a little russet about the stem and many brown dots. Season winter.

21. *Winter Jonah.*—Tree a medium grower. Fruit of medium size, roundish. Stalk one inch long, stout, and set in a very slight depression. Calyx large, open. Basin narrow and shallow. Skin pale yellow, with a faint blush on the sunny side, a few small dark greenish yellow spots, and many small gray dots. Season winter.

PLUMS.

The season has been a very poor one for this fruit. The spring was unfavourable and bad weather conditions prevailed from the time the trees were in bloom until the crop was ripe. Cold rains in blooming time prevented a free setting of fruit and frequent rains afterwards interfered with effectual spraying to protect the fruit from rot, which was very prevalent again this season. This was especially so on the Experimental Farm orchard, where there are so many varieties, some of which are very susceptible to rot, and these spread the spores to other trees, and cause injury to the fruit of varieties that are, or would be under more favourable conditions, almost, if not quite, free from the disease. Very few of those most recently planted have fruited this year; the trees have in most cases grown well, and many of them bloomed, but the fruit did not set. The most satisfactory sorts which have fruited are listed in the

order of their ripening. All are vigorous growers and free producers and desirable fruits.

Clyman,	Cochet Pere,	Diamond,
Angelina,	Blue Apricot,	Bittern,
Burdette,	Belgian Purple.	Grand Duke,
Goliath,	Tragedy Prune,	Monarch,
Lincoln,	Sultan,	Italian Prune.
Mallard,	Mitchelson,	

The following varieties fruited for the first time :—

1. *Blue Rock.*—Tree a vigorous grower. Fruit of medium size, round, slightly flattened at stem. Stem short, inserted in a small cavity. Suture distinct. Skin dark purple, with a heavy whitish bloom and sprinkled with small gray dots. Flesh yellowish, juicy, sweet, with a rich pleasant flavour. Season middle of August.

2. *Reine Claude Davion.*—Tree a strong grower. Fruit below medium in size, globular. Suture short and shallow. Stem short and set in a small depression. Skin pale greenish yellow, with reddish purple spots. Flesh greenish yellow, sweet, juicy, with a pleasant flavour. Season middle of August.

3. *Apple.*—Tree a vigorous grower. Fruit large, round, heart-shaped. Suture deep and terminating in a point one side enlarged. Stem of medium length and set in a shallow depression. Skin deep glossy red with many small white dots. Flesh yellowish, stained with red, sweet, sprightly with a pleasant flavour. Season August.

4. *Late Prolific.*—Tree a strong grower. Fruit below medium size, globular. Suture very shallow and short. Stem medium size and no cavity. Skin dark purple, with a heavy bluish bloom. Flesh greenish yellow, juicy, with a pleasant flavour. Stone small. Season late August.

5. *Guthrie's Green Gage.*—Tree a vigorous grower. Fruit above medium in size. globular, one side enlarged. Skin greenish yellow, with a thin whitish bloom. Stem short. Cavity small and shallow. Flesh greenish yellow, juicy, sweet, with a fine flavour. Season last of August.

6. *Late Orange.*—Tree a strong grower. Fruit large, globular. Suture distinct. Stem short, in a narrow depression, one side enlarged. Skin deep orange, with a reddish cheek. Flesh juicy, tender, sweet, with a pleasant flavour. Season last of August.

7. *Late Black Orleans.*—Tree a vigorous grower. Fruit below medium in size. round. Suture distinct. Stem of medium length, set in small cavity. Skin black, with a thin blue bloom and sprinkled with brown dots. Flesh yellow, juicy, sweet, with a pleasant flavour. Season September.

8. *Kentish Diamond.*—Tree a medium grower. Fruit of medium size, oval, pointed at the apex. Suture distinct, one side enlarged. Stem of medium length. Skin black, with a light blue bloom. Flesh yellowish, rather coarse, not very juicy, sprightly. Season September.

9. *Brahy's Green Gage.*—Tree a strong grower. Fruit medium to large, roundish. Suture wide. Stem short and stout. Cavity wide. Skin greenish yellow, mottled with darker green, and a thick white bloom. Flesh yellowish green, juicy, sweet, with a pleasant flavour. Season September.

10. *Wyedale.*—Tree a strong, upright grower. Fruit of medium size, roundish, oval. Stem short. Cavity small. Suture distinct. Skin dark greenish purple, with a whitish bloom. Flesh greenish, juicy and sprightly. Season October.

CHERRIES.

As in the case of the other fruits, the cold, wet weather prevented the blossoms setting, and the small crop of sweet cherries which some trees produced were cracked and spoiled by the rains when they were maturing.

Very few of the young trees blossomed, and only one or two produced fruit.

1. *Bigarreau Jaboulay.*—Tree a strong grower. Fruit very large, blunt, heart-shaped. Stem long and set in a shallow depression. Skin dark glossy red. Flesh and juice red, tender, sweet, juicy, with a very fine flavour. Last of June.

2. *Amarelle Hative.*—Tree a slender, vigorous grower. Fruit below medium size, roundish. Stem long and set in a narrow depression. Skin deep glossy red. Flesh and juice red, tender, juicy, sprightly, very pleasant. Season last of June.

3. *Brindilles.*—Tree a low slender grower. This variety has blossomed for two years in middle of June, and the fruit ripens late in August. The two trees are healthy and vigorous. Fruit of medium size, round, depressed or oblate. Stem long, set in a narrow depression. Skin light, clear red. Flesh reddish, tender, juicy, sprightly. Ripe last of August.

PEACHES, APRICOTS AND NECTARINES.

The few trees of these fruits which remain have bloomed freely both on the mountain and on the level land, but there was no fruit.

QUINCES.

Portuguese.—This variety makes a vigorous growth, and fruited last year and again this season. It is promising, as the fruit is fine, and having fruited in two unfavourable years in succession, it is likely to be a regular bearer. It is the only one of the quinces tried which has produced fruit, although several varieties were planted in the spring of 1890, and have grown to be fairly large bushes.

MEDLARS.

All varieties of this fruit produced crops again this year.

GRAPES.

The grapes were very late in starting growth this season and late in blossoming. Nearly all the vines produced fruit, but owing to the late spring and cool wet autumn, even the earliest sorts did not ripen.

MULBERRIES.

As usual the mulberry trees were full of fruit, which is very much appreciated by the robins.

MOUNTAIN ORCHARDS.

The fruit trees on the mountains continue to make a strong growth, and a few of the apple trees produced fruit this season, but being so far isolated and unprotected, birds and wild animals destroy much of the fruit. As it has been clearly demonstrated that fruit trees as well as nut trees do well on these lower hills this will be a guide to many who may be able to preserve and protect trees in such situations.

NUT ORCHARDS.

The English and American black walnuts produced a small crop of nuts this year, and the Japanese walnut and the heart-shaped walnut gave fine crops. All of these nuts are being distributed to planters throughout the province, and many report very fair success in growing the young trees.

SMALL FRUITS.

The crop of small fruits was fairly good this year, although a little later than usual.

YELLOW AND RED RASPBERRIES.

There are now under test here seventy-three varieties of red and yellow raspberries. These have all been described in previous reports.

After several years' trial under similar conditions, the following varieties have proved the best: In quality Sarah is superior to all the others, and equal to any in productiveness, although it is not quite so firm as Cuthbert.

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Red Phœnix	June 28	Vigorous	Large	Firm, good quality	Productive.
New Fastolf	July 4	"	"	" "	"
Duke of Brabrant	" 4	"	"	" "	"
Northumberland Fill Basket.	" 4	"	Very large	" "	"
Belle de Fontenay	" 5	"	Large medium	" "	"
Sarah	" 6	"	"	Very good quality	"
Lord Beaconsfield	" 7	"	Large	Firm, good quality	"
London	" 7	"	Large medium	" "	"
All Summer	" 9	"	Large	" "	"
Cuthbert	" 9	"	"	" "	"
R. B. Whyte	" 10	"	"	" "	"
French Vice-President	" 10	"	"	" "	"
Shaffers Colossal	" 10	"	"	Purplish red; firm; acid, fair quality.	"
Yellow Golden Queen	" 6	"	"	Firm, good quality	"
Large Yellow	" 7	"	"	" "	"

BLACK CAP RASPBERRIES.

Nineteen varieties of Black Cap raspberries are under test.

Black Caps are rather an uncertain crop. They require very rich ground and moisture, as well as sunshine when the berries are growing and ripening.

The following are the best which have been tried here:—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Nemaha	July 10	Vigorous	Large	Good quality	Productive.
Conrath	" 10	"	" medium.	"	"
Older	" 10	"	" "	"	"
Kansas	" 10	"	" "	"	"
Palmer	" 11	"	Medium	"	"
Gregg	" 11	"	Large	"	"
Progress	" 11	"	" medium.	"	"
Mammoth Cluster	" 12	"	"	"	"
Ida	" 12	"	" medium.	"	"

BLACKBERRIES.

The blackberries were a good crop this year. There are twenty-nine varieties of this fruit under trial here; of these the following are the best, named in the order of merit:—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Eldorado	July 22	Vigorous	Large	Sweet; melting; no core.	Productive.
Stone's Hardy	" 22	"	"	Very good quality	"
Erie	" 24	"	"	" "	"
Maxwell	" 28	"	"	" "	"
Early King	" 15	"	"	" "	"
Snyder	" 20	"	" medium.	" "	"
Agawam	" 26	"	"	" "	"
Taylor	" 25	"	"	" "	"
Hansel	" 20	"	"	" "	"

The only blackberry fruiting this year for the first time was the Rathburn, July 20. A weak grower. Fruit small to large, of medium quality, sweet, moderately productive.

RED AND WHITE CURRANTS.

The crop of currants as a whole was rather light. Of the forty-two varieties under test, the following are the best:—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Red Cherry	July 4	Vigorous	Large	Very good quality	Productive.
London	" 4	"	Large medium	Good quality	"
Raby Castle	" 4	"	"	"	"
Pomona	" 4	"	"	"	"
La Fertile	" 4	"	"	"	"
La Conde	" 5	"	"	"	"
Prince Albert	" 6	"	"	"	"
White Cherry	" 8	"	"	"	"
Red Gondoin	" 10	"	"	"	"
Large, white Brandenburg	" 10	"	"	"	"
Victoria	" 10	"	"	"	"
White Pearl	" 10	"	"	"	"

BLACK CURRANTS.

Fifty-one varieties of black currants are under test here. Of these the following are the best:—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Dominion	July 10.	Vigorous ...	Large medium	Good quality	Productive.
Merveille de la Gironde	" 10.	" ...	" ..	"	"
Boskoop Giant..	" 10.	" ...	Very large....	Very good quality...........	"
Prince of Wales.	" 10.	" ...	Large	Good quality	"
Middlesex......	" 10.	" ...	"	"	"
London	" 12.	" ...	Large medium	"	"
Victoria........	" 12.	" ...	" ..	"	"
Baldwin	" 12.	" ...	" ..	"	"
Black Naples...	" 12.	" ...	" ..	"	"
Lee's Prolific . .	" 12.	" ...	" ..	"	"
Pearce	" 12.	" ...	" ..	"	"
Pomona	" 12.	" ...	Large	"	"
Climax.........	" 12.	" ...	Large medium	"	"

METEOROLOGICAL RECORD.

Date of Highest Temperature.	Temperature.	Date of Lowest Temperature.	Temperature.	Rainfall.	Snowfall.	Sunshine.	
1902.	°		°	Inches.	Inches.	Hours.	Minutes.
December 1.........	50	December 10.	27	6·74	6	17	12
1903.							
January 2	53	January 26	26	4·49	9	41	42
February 19	52	February 2	21	1·04	0	130	18
March 27.	62	March 11	18	4·04	20	131	12
April 28............	65	April 22.	30	5·30	....	89	30
May 30.............	76	May 14..........	36	3·58	....	128	54
June 9.............	93	June 6...........	46	6·00	....	159	00
July 11.............	89	July 8............	44	2·30	....	184	18
August 10	85	August 27........	44	5·08	....	132	54
September 18.......	75	September 30.....	35	7·30	....	106	00
October 24.........	68	October 14 and 15.	33	2·71	....	111	24
November 2	54	November 17.....	22	3·31	11	32	12
		Totals..	....	51·89	46	1,264	36

Although the season has been so showery during haying and harvest, the rainfall has for the whole year been below the average.

I have the honour to be, sir,

Your obedient servant,

THOMAS A. SHARPE.

STATEMENT OF EXPENDITURE ON THE DOMINION EXPERIMENTAL FARMS FOR THE YEAR ENDING JUNE 30, 1903.

CENTRAL EXPERIMENTAL FARM—EXPENDITURE, 1902-3.

Live stock	$ 1,146 08
Feed for stock, including supplies from experimental plots, $295.50.	1,496 43
Veterinary services and drugs	64 06
Seed grain seeds, trees, &c	446 21
Implements, tools, hardware and supplies	708 67
Drainage and drain tiles	1,958 06
Manure and fertilizers for experimental plots and horticultural department	310 42
Travelling expenses	1,651 66
Exhibition expenses, including value of grain held over for exhibitions	723 33
Blacksmithing, harness supplies and repairs	379 54
Bee department	218 47
Salaries of officers engaged in the general work of the farms, proportion chargeable to the Central Farm	1,792 49
Wages, farm work, including experimental work with grain and other farm crops; also salaries of officers in charge	6,840 84
Wages, care of stock	3,087 45
Chemical division, proportion chargeable to Central Farm	1,412 90
Botanical and Entomological division, proportion chargeable to the Central Farm	1,442 56
Horticultural division, including salary of officer in charge	5,110 92
Poultry division, including all supplies; also salary of officer in charge	1,992 04
Forestry division and care of grounds	1,335 81
Arboretum, including drawing and spreading of 380 loads of gravel on roads	1,892 03
Distribution of trees and tree seeds, including $85.58 value of tree seeds supplied by Brandon and Indian Head Farms	157 74
Office help, correspondence branch and messenger service	4,018 71
Printing of office supplies and stationery	826 68
Seed testing and care of greenhouses	1,019 39
Dairy branch, including wages of dairyman	715 27
Contingencies, including $104 for 197 loads of gravel and work on roads	320 34
Books and newspapers	104 35
Telegrams and telephones	144 06
Steers purchased for feeding experiments	2,787 85
	$ 44,104 36
Less—Proceeds of sale of steers purchased for feeding experiments	4,082 00
	$ 40,022 36

EXPERIMENTAL FARM, NAPPAN, N.S.—EXPENDITURE, 1902-3.

Live stock	$ 205 68
Feed for stock	1,816 77
Veterinary services and drugs	26 68
Seed grain, seeds, trees, &c.	27 17
Implements, tools, hardware and supplies	261 57
Manure and fertilizers	70 60
Travelling expenses	168 19
Exhibition expenses	269 90
Blacksmithing, harness supplies and repairs	63 21
Salary of Superintendent, including proportion of salaries for general work, Ottawa	2,545 62
Wages, farm work, including experimental work with farm crops	2,109 48
Wages, care of stock	1,353 08
Chemical division, proportion chargeable to each branch farm	824 19
Botanical and Entomological division, proportion chargeable to each branch farm	586 25
Poultry branch	89 87
Horticultural division, including experimental work with vegetables, fruits, forest and ornamental trees and flowers; also care of grounds and salary of officer in charge	1,408 68
Distribution of seed grain, potatoes, &c	198 14
Contingencies, including postage, $105; mail delivery, $82.50	237 50
Printing and stationery	23 57
Books and newspapers	23 50
Telegrams and telephones	19 05
Drainage and drain tiles	11 25
Steers purchased for feeding experiments	990 00
	$ 13,329 95
LESS—Proceeds of sale of steers purchased for feeding experiments	1,830 00
	$ 11,499 95

EXPERIMENTAL FARM, BRANDON, MAN.—EXPENDITURE, 1902-3.

Live stock		$ 244 67
Feed for stock		182 07
Veterinary services and drugs		21 65
Seed grain, trees, seeds, &c.		33 86
Implements, tools, hardware and supplies		746 49
Travelling expenses		124 26
Exhibition expenses		185 16
Blacksmithing, harness supplies and repairs		218 10
Bee department		13 84
Salary of Superintendent, including proportion of salaries for general work, Ottawa		2,545 62
Wages, farm work, including experimental work, with farm crops, &c.		2,347 91
Wages, care of stock		929 00
Chemical division, proportion chargeable to each branch farm		824 19
Botanical and Entomological division, proportion chargeable to each branch farm		586 25
Horticultural branch, including experiments with vegetables, fruits and flowers; also care of arboretum and grounds		502 64
Forestry branch, including care of hedges		360 50
Poultry branch		62 62
Office help, including delivery of mail, $110		689 99
Distribution of seed grain, potatoes, &c.		225 90
Distribution of trees and tree seeds		306 81
Contingencies, including postage, $243.06		268 82
Printing and stationery		37 50
Books and newspapers		18 00
Telegrams and telephones		30 43
Drainage and drain tiles		53 50
Manure and fertilizers		239 25
Steers purchased for feeding experiments		474 17
		$ 12,273 20
LESS—Proceeds of sale of steers purchased for feeding experiments	$ 566 05	
Value of grain supplied for seed distribution at Ottawa	125 48	
		691 53
		$ 11,581 67

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.—EXPENDITURE, 1902-3.

Live stock		$ 37 16
Feed for stock		39 20
Veterinary services and drugs		45 35
Seed grain, seeds, trees, &c		13 70
Implements, tools, hardware and supplies		919 83
Travelling expenses		143 13
Exhibition expenses		19 83
Blacksmithing, harness supplies and repairs		111 95
Salary of Superintendent, including proportion of salaries for general work, Ottawa		2,545 62
Wages, farm work, including experimental work with farm crops		2,958 99
Wages, care of stock		819 90
Chemical division, proportion chargeable to each branch farm		824 19
Botanical and Entomological division, proportion chargeable to each branch farm		586 25
Horticultural branch		388 53
Poultry branch		67 13
Forestry branch, including hedges		65 00
Office help, including delivery of mail		594 54
Distribution of seed grain, potatoes, &c		596 42
Distribution of trees and tree seeds		101 25
Contingencies, including postage, $378.38		479 98
Printing and stationery		50 79
Telegrams and telephones		37 90
Manure and fertilizers		37 00
Books and newspapers		6 00
Steers purchased for feeding experiments		700 87
		$ 12,190 51
Less—Proceeds of sale of steers purchased for feeding experiments	$ 909 30	
Value of grain supplied for grain distribution at Ottawa	712 64	
		1,621 94
		$ 10,568 57

EXPERIMENTAL FARM, AGASSIZ, B.C.—EXPENDITURE, 1902-3.

Live stock	926 30
Feed for stock	76 74
Veterinary services and drugs	6 30
Seed grain, seeds, trees, &c	105 19
Implements, tools, hardware and supplies	348 39
Manure and fertilizers	160 06
Travelling expenses	124 29
Exhibition expenses	323 44
Blacksmithing, harness supplies and repairs	80 56
Salary of Superintendent, including proportion of salaries for general work, Ottawa	2,545 61
Wages, farm work, including experimental work with farm crops, vegetables, fruit trees, vines, &c	2,445 23
Wages, care of stock	542 96
Chemical division, proportion chargeable to each branch farm	824 19
Botanical and Entomological division, proportion chargeable to each branch farm	586 25
Poultry branch	70 30
Forestry branch, including care of hedges	134 40
Office help	112 50
Distribution of seed grain, potatoes, &c	160 74
Distribution of trees and tree seeds	2 00
Clearing land	596 40
Contingencies, including postage, $110.22	155 63
Printing and stationery	0 70
Books and newspapers	21 50
Drainage and drain tiles	105 95
	$ 10,455 63

SUMMARY OF EXPENDITURE, 1902-3.

Central Experimental Farm		$ 40,022 36
Nappan "		11,499 95
Brandon "		11,581 67
Indian Head "		10,568 57
Agassiz "		10,455 63
Distribution of seed grain, potatoes, &c., from Central Experimental Farm, including value of grain supplied from Brandon and Indian Head Experimental Farms		5,871 82
Printing bulletins and distribution of bulletins and reports.	$ 7,000 00	
LESS special sum in estimates for this item	7,000 00	
		$ 90,000 00

SUMMARY OF STOCK, MACHINERY, IMPLEMENTS, &c., ON HAND DECEMBER 31, 1903.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

19 Horses	$ 3,765 00
13 Ayrshire cattle	1,515 00
12 Guernsey cattle	1,330 00
11 Durham cattle (Shorthorns)	2,705 00
7 Canadian cattle	875 00
34 Grade cattle	875 00
31 Yorkshire swine	840 00
5 Berkshire swine	175 00
7 Tamworth swine	158 00
140 Grade swine	697 19
4 Large black swine	120 00
25 Shropshire sheep	665 00
9 Leicester sheep	245 00
1 Grade sheep	12 00
Farm machinery and implements	2,782 50
Vehicles, including farm wagons and sleighs	1,129 00
Hand tools, hardware and sundries	1,099 65
Harness	553 25
Dairy department, machinery, &c	510 00
Horticultural and forestry departments, implements, tools, &c	606 25
Botanical department, implements, tools, &c.	4 95
Poultry department, 222 fowls	218 75
Poultry department, implements, furnishings, &c	113 30
Bees and apiarian supplies	454 78
Chemical department, apparatus and chemicals	1,875 00
Books in several departments	546 55
Greenhouse plants, supplies, &c.	2,082 75
Furniture at Director's house	1,100 00
Office furniture and stationery	1,617 25
	$ 28,671 17

EXPERIMENTAL FARM, NAPPAN, N.S.

8 Horses	$ 1,085 00
5 Guernsey cattle	905 00
5 Holstein cattle	325 00
14 Ayrshire cattle	890 00
1 Jersey cow	50 00
48 Grade cattle	1,567 50
5 Yorkshire swine	120 00
3 Berkshire swine	70 00
52 Grade swine	290 00
16 Sheep	245 00
100 Fowls	60 90
Bees and apiarian supplies	10 30
Vehicles, including farm wagons and sleighs	386 50
Farm machinery	517 00
Farm implements	213 00
Hand tools, hardware and sundries	360 45
Harness	185 50
Furniture for reception room and bedroom for visiting officials	154 00
Furniture supplies and books for office	90 00
	$ 7,525 15

EXPERIMENTAL FARM, BRANDON, MAN.

12 Horses	$	1,075 00
3 Ayrshire cattle		150 00
5 Durham cattle		475 00
2 Guernsey cattle		150 00
7 Grade cattle		297 00
1 Tamworth pig		15 00
4 Berkshire swine		40 00
5 Yorkshire swine		50 00
1 Grade pig		5 00
93 Fowls		93 00
Bees and apiarian supplies		101 95
Vehicles, including farm wagons and sleighs		435 00
Farm machinery		2,126 33
Farm implements		654 00
Hand tools, hardware and sundries		643 75
Harness		218 50
Furniture for reception room and bedroom for visiting officials		161 55
Furniture supplies and books for office		286 30
	$	6,977 38

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

13 Horses	$	1,460 00
18 Durham cattle		1,625 00
19 Grade cattle		660 00
3 Berkshire swine		45 00
8 Tamworth swine		85 00
2 Yorkshire White swine		45 00
6 Grade swine		36 00
63 Fowls		63 00
Bees and apiarian supplies		25 75
Vehicles, including farm wagons and sleighs		576 00
Farm machinery		2,213 33
Farm implements		718 00
Hand tools, hardware and sundries		373 55
Harness		185 30
Furniture for reception room and bedroom for visiting officials		217 50
Furniture supplies and books for office		367 50
	$	8,695 93

EXPERIMENTAL FARM, AGASSIZ, B.C.

6 Horses	$	715 00
17 Durham cattle		1,275 00
14 Dorset horned sheep		127 50
8 Berkshire swine		110 00
3 Yorkshire White swine		85 00
76 Fowls		56 00
Bees and apiarian supplies		43 95
Vehicles, including farm wagons		207 50
Farm machinery		508 50
Farm implements		137 50
Hand tools, hardware and sundries		153 50
Harness		91 00
Furniture for reception room and bedroom for visiting officials		165 40
Furniture supplies and books for office		129 00
	$	3,804 85

THOS. M. CRAMP, *Accountant.*

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